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OCTOBER 1954

VOLUME 29 • NUMBER 10

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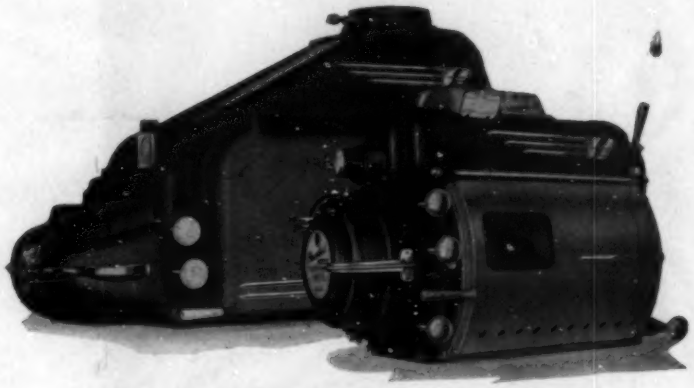

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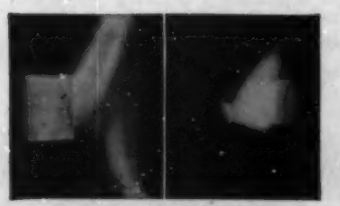

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With Which Is Combined PROJECTION ENGINEERING

JAMES J. FINN, *Editor*

JAMES MORRIS, *Associate Editor*

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MONTHLY CHAT

THE premiere showing of the VistaVision film "White Christmas" at the Radio City Music Hall in New York City utilized a novel unit of projection equipment — a mechanism which employs a turned projector head and thereby permits the horizontal projection of a film image equal in size to two of the presently standard projection film frames.

There is no question but that this projection technique represents a major advance in the art, as detailed elsewhere in this issue. However, in view of the wide publicity given this mechanism in the general industry trade press, IP stresses the point that this custom-made job was planned and executed for the specific Music Hall situation, which is widely recognized as the foremost exhibition auditorium in the world.

The present screen image of the Music Hall is 59 feet wide and is most impressive in terms of visual clarity and sharpness. Some two months ago, however, we witnessed the presentation of the very same film *via* standard vertical projection means which, to our mind, gave an equally satisfactory image. The issue being discussed here is whether under the present fluid state of technological developments we shall have to awake each morning only to be confronted by a new principle for the relatively simple process of projecting a motion picture. There is no question but that this new horizontal projection method has certain definite advantages; but it is a moot question whether a special installation of this sort is warranted for 95% of theatres on either a technical or economic basis.

If we continue to course the path of additional equipment and expense every time a producer of motion pictures has a new fancy, we can only anticipate economic disaster. We must remember, also, that at the present time there are two major efforts being expended to utilize 70-mm film which will employ the present standard vertical projection method. To our mind, there is little if any justification for applying Music Hall standards to the vast majority of smaller theatres throughout the world.

IP's view is that a proper regard for the economic welfare of the industry at large dictates that a considerable degree of caution be exercised at the moment — particularly in view of the lack of any agreement on standard procedure. Once a given process has proven itself, we may then move to utilize its advantages on a sound technical and economic basis.

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October 1954

A summary of opinion which, while relating to a specific situation, applies with equal force to the fundamental requisites of the art of visual and sound projection. The appended expressions of various viewpoints reflect IP's policy of providing a forum for anybody who has anything interesting to say anent the projection process.

A Case In Point:

Top-Notch Projection Demands Top-Notch Equipment

To the Editor of IP:

Our efforts to increase our screen light embraced, among other things, the idea of using water-cooling for our lamphouse. Is is a fact that through the use of water-cooling jackets we will actually lose light? This seems to be a very controversial subject in projection circles, thus our appeal to IP for factual information. The basic problem is simple: how can we increase the light on our screen?

Our equipment set-up is as follows: a pair of Gardner heads with barrel-type shutters, with the shutters trimmed down to the point where we get a slight travel-ghost; Kollmorgen 4-inch, *f*/2 coated lenses; Strong Mogul lamps; metal reflectors; carbon trim of 8 x 9 Orotip Suprex, pulling 75-80 amps; RCA tube rectifiers for 40-volt, 80 amp, 3-phase; projection throw 250 feet.

Formerly our screen was 35 x 48 feet, surfaced with white asbestos siding (Johns-Manville). Now that we are converting for CinemaScope, we plan upon a screen 35 x 78 feet, with the same J-M siding. Light is our chief concern, as you will understand. Any assistance you are able to render will be greatly appreciated.

I think that you have a wonderful magazine. Other publications give me this "canned" information, but I have learned through the years to rely upon the integrity of IP.

JOHN "PAT" ELZEY

Pat Drive-In Theatre, Vidalia, Louisiana.

IP's Viewpoint:

IT IS our impression that the light on your present screen is somewhat less than you would like it to be. And, as you are aware, the light will drop to about half its present level when you change to CinemaScope—unless something is done to increase it.

The obvious and most effective remedy is, of course, the purchase of more powerful lamps together with appropriate rectifiers. This, as you say, is *out* for the present, so we'll see what can be done for a smaller outlay of cash.

First thing, we'll advise you not to spend money for something you don't need just now, and which will *decrease*, not *increase*, the brightness of your picture. We are talking about carbon-cooling water jackets. These devices improve the quality of the light, and they also make satisfactory operation of the lamps much easier; *but* they *always* decrease light-output by about 15% *unless the carbons are already overloaded.*

Carbon coolers increase light with an overloaded trim by preventing spindling, thus enabling a larger, somewhat shallower crater to be formed in the end of the overloaded positive carbon. This holds the luminous ball of ionized gas at the tip of the carbon and prevents it from streaming out as an oversize tail-flame. The tail-flame adds little or nothing to screen illumination.

Your 9-8 mm trim, however, seems to be a trifle *underloaded;* and the use of carbon coolers in your lamps *with your present rectifiers* will decrease your screen illumination by at least 15%, and possibly more. The water-cooled crater is slightly larger

than an uncooled crater, it is true, but crater brightness in the cooled carbon is approximately 30% under that of an uncooled carbon when the amperage remains the same.

Water-cooled carbons burn somewhat more slowly than uncooled carbons, and this means just one thing—less light at the *same* power-consumption. Charles A. Hahn of J. E. McAuley Mfg. Co., stressed this fact in the July 1953 issue of IP (page 21).

"As Simple as That"

In the case of carbon arcs," he wrote, "the main product we seek through their consumption is *light*, and its quality or volume is determined by the amount of carbon that is consumed. . . . All things being equal, we doubt if anybody can reduce the consumption-rate of a fuel and still come up with a gain in the output of the product you burn it for. It's as simple as that."

Purely fanciful claims won't increase your light. If your screen were smaller, and if you could feed 100 amps to your arcs, then carbon-coolers would be advantageous to you. Your lamphouses would be less hot, your screen would be more evenly lighted, and color changes would not be so apt to occur during changeovers. Under these conditions you would use carbon cooling. But under the actual existing conditions in your theatre, carbon coolers won't do you a bit of good, and, in fact, will rob you of light you can't afford to lose.

For comprehensive technical studies of the effects of water-cooling on arc operation, we refer you to *The Effect of Carbon Cooling on High Current Arcs by* Wolfgang Finkelnburg, Research and Development Laboratories, Fort Belvoir, Virginia (IP for June 1949, p. 14), and to *High-Brightness Carbon Arcs* by M. T. Jones and F. T. Bowditch, National Carbon Co. (IP for July 1949, p. 12).

Now let's take a look at your projection setup and see if anything can be changed to give you more light.

Your metal arclamp reflectors are doing your business as much harm as anything. This is something else you can get away with if you have plenty of light to begin with. The type of metal mirrors you are using are made of steel plated with rhodium, a shiny metal of the platinum family. These mirrors reflect only about 75% as much visible light as silvered glass mirrors, but just as much heat (infrared). So get glass mirrors for your lamps, and you will gain 25% more light. Two new mirrors will be sufficient, as you can save your metal mirrors for spares in case of breakage.

Optical Set-up Vital

When changing mirrors, don't fail to line up your lamps for maximum light production. The focal lengths of commercial mirrors often differ slightly, so if it's possible to readjust the mirror-to-aperture distance, try different distances until you get the brightest light. And, of course, all the optical components—mirror, carbons, aperture, and projection lens—must be in a *straight line* to get good light. Even a slight deviation can ruin your screen illumination.

The writer has often used metal mirrors, and while he appreciates mirrors that can't pit or break, he is not too happy about a 25% loss of light. The light from metal mirrors is yellower, or "softer," than that from silvered-glass mirrors, so you can expect color films to look better on your screen after you have made the change to glass mirrors. Protect your glass mirrors from sudden drafts and deposits of soot to insure against breakage. Sooty spots, which may be formed when the arc is struck too slowly, often crack mirrors because they absorb a great deal of heat.

Carbon Trim, Power Supply

You are burning the proper amperage in your lamps, but the voltage supplied by your rectifiers is a trifle too low for the best light. The rectifiers you are using are better suited to 8/7 mm trims. Your present 9/8 mm trim requires at least 45 volts to produce a crater of proper diameter and depth. You will probably find that the craters in your positive carbons are too small in diameter and too deep. Just as an experiment, you might try the smaller trim (8 mm positive with 7 mm negative, both copper-coated) just to see what happens to the light. Better still, change to rectifiers supplying 50 volts.

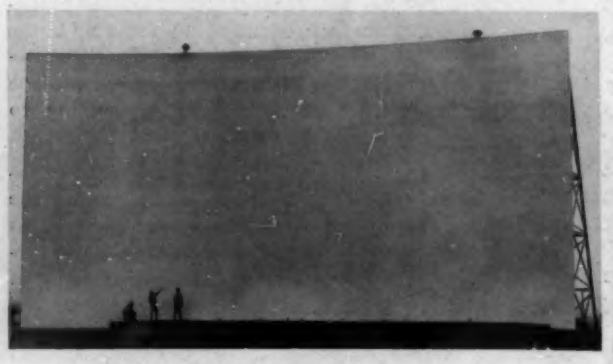
Travel-ghost isn't a good thing; and if you were getting plenty of light, you wouldn't want a trace of it in your pictures. But it would seem that you were justified in trimming your shutters a *little* beyond the limit to get every bit of light posible. Every lumen helps when the light is inadequate.

And this brings up the subject of your screen. The white asbestos siding with which your screen is surfaced has a reflective power of approximately 65%. A regular white movie screen reflects from 75% to 80% *even when perforated*. We realize that asbestos siding is a common screen surface in drive-ins, but by coating this siding with a weatherproof flat white paint of good quality the reflectivity can be stepped up to at least 80%, and may even go up to 90%. It is best to obtain a paint made for this purpose and, at any rate, paints containing white lead should be avoided. White lead turns yellowish in the course of time due to the formation of brownish-black lead sulfide.

Proper Screen Surface

It may be best to use such a white surface on your new CinemaScope screen. The use of an aluminized surface is ruled out if your projectors tilt upwards toward the screen. With an upward projection angle, an aluminum screen would merely throw most of the light into the sky where it would do no good.

It is unfortunate that no one has yet devised a weatherproof beaded



Screen used for the first CinemaScope drive-in presentation at the Motor Vu Drive-In Theatre, Salt Lake City. Enormity of screen, 102 by 48 feet, may be gauged by comparing its range with human figures shown at lower left.

What's a lily to a lady?

This particular lily may not "toil"—but it certainly does "spin" an important yarn for the processor.

Are the colors in balance? Are the flesh tints correct? How about gray scale values?

These together with many other questions, "the lily" answers quickly, authoritatively. For it is the test standard for tone values in release prints, a step wedge with color patches added.

In areas like this—how best to use various devices and tests, how to set up systems and controls, the Eastman Technical Service for Motion Picture Film is working with the industry—helping make today's motion picture production increasingly efficient—adding thus to the effectiveness of both black-and-white and color.

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surface for drive-in screens. Beaded screens are "specular," but unlike aluminized screens, they throw the light back in the same direction from which it came. The so-called Scotchlite surfacing used for making road-signs more visible when illuminated by auto headlights, has the same reflecting characteristics. Scotchlite screens would be ideal for drive-ins having a comparatively narrow viewing area.

To conclude, we believe that you can increase your screen illumination substantially by (1) using glass mirrors, (2) painting your screen with white paint made for drive-in screens, and (3) making a slight increase in your arc voltage, if this can be done. The use of an 8/7 mm carbon trim is an alternative which might possibly give a slight increase in screen light.

By CHARLES E. HAHN

J. E. McAULEY Mfg. Company

ANALYZING the projection situation at the Pat Drive-In Theatre, strange as it might seem, I believe that their present light source (if they eliminate their existing light losses) will result in sufficient light gain to give them a very well-illuminated CinemaScope picture of the size they intend to use—35 x 78 feet.

First of all, they are using a metal reflector, and this means an immediate loss of 20 to 25%. This reduced volume of reflected light is then projected through a barrel-type shutter which, in the writer's opinion, passes 38.7% of the already reduced total light. From the aperture, it passes through an *F*/2 projection lens, which at the focus he uses (4-inch) passes approximately 12 to 15% less light than would the same focus lens having a speed of *F*/1.8.

Now, let's see what all of these losses add up to. To begin with, the metal reflector-arc Mr. Elzey is now using would. if he had used a glass reflector, produce 15,000 screen lumens, according to the manufacturer's statements. The 20-to-25% loss that immediately takes place with the use of a metal reflector brings this total screen lumen count down to 11,625.

Now, since his barrel-type shutter passes only approximately 38.7% of this amount of light, he is now passing through the aperture only 4,500 lumens. Finally, because he is using an *F*/2 projection lens, accounting for another 12% loss, his total screen lumen figure is further reduced to 3,960. Thus, in his present set-up he is getting a loss of 11,040 lumens from a possible total of 15,000.

In changing to CinemaScope, the writer suggests that Mr. Elzey put in a new projector mechanism having an efficient revolving-shutter arrangement, an *F*/1.8 projection lens, and use a silvered reflector. He will then probably find that he has made a sufficient "for free" gain in illumination to produce a CinemaScope picture of the size he mentions. Possibly, this picture will be better illuminated than the level he is now obtaining with his present set-up and a 1.37/1 aspect ratio picture field.

By FRED C. MATTHEWS

Motiograph, Inc.

DRIVE-IN theatre owners who have increased the width of their screens to 100 feet or more should make immediate plans to whiten and resurface their present screens.

To best present CinemaScope productions and other wide-screen pictures, it is suggested that screens be increased in *both* height and width. For example, a present 30 x 40-foot screen should be increased in the proportion of 50 x 102-feet, if the theatre is to show a 2/1 image just as wide as a CinemaScope picture. If, however, it is wished to show only CinemaScope pictures to the full width of the screen, the height of the screen need not be increased in proportion mentioned above. The size of the screen and its proportion is a matter of individual taste.

Having arrived at the desired size and proportion of your screen, the next problem is to determine what is required in screen surfacing materials and finish. Most new screens have been resurfaced in "Transite" or plywood and finished with 3 coats of white paint similar to that made by Raytone Screen Co. There have been also a few screens refinished with an undercoat of aluminum paint and a second coat of white paint. The writer has seen screens finished with both types of paint, and screen results were quite satisfactory.

Some companies are offering both fibre glass and aluminum screen materials for resurfacing screens. Opinion on the respective merits of these materials is divided.

The change in the size of the picture will require a new set of projection lenses, and if pictures with varied aspect ratios are to be shown, more than one set will be required. It is recommended that fast anti-reflection coated lenses be purchased, as the use of cheap "slow" lenses could nullify some of the light gained from the use of higher-amperage arclamps. CinemaScope pictures require anamorphic lenses. There are at least 6 brands of such lenses available (fixed condenser-type and variable).

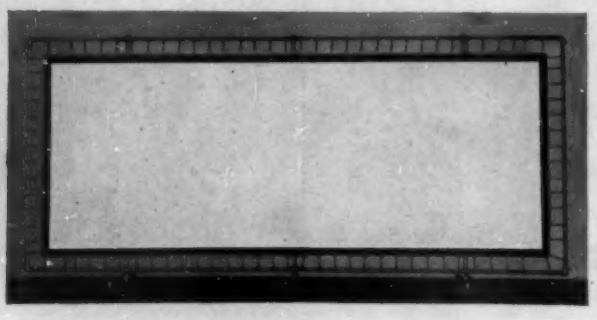
The most important item of equipment needed is new arclamps. Regardless of all claims of screen reflectivity, it is absolutely essential to have high-powered arclamps. There are only two types of arclamps that offer anywhere near sufficient screen illumination for screens in excess of 30 feet wide:

1. Reflector-type arclamps with rotating, positive-carbon mechanisms operating at 85 to 135 amperes.
2. Condenser-type arclamps operating at 160 to 180 amperes.

The reflector-type lamps, while vary-

(Continued on page 30)

NEW RADIANT WIDE SCREEN FOR 16-MM PROJECTION AVAILABLE



Signalizing the positive entry of wide-screen images into the 16-mm field is this new semi-portable aluminum frame and screen for 16-mm projection recently developed by the Radiant Mfg. Co. of Chicago. It is available in two sizes — 6 x 16 and 8 x 21 feet

YOUR PICTURE BRILLIANCE

is in direct proportion to the efficiency of your mirror!

No arc can give you a bright picture if the mirror in your lamp has deteriorated in efficiency, for THE ONLY LIGHT WHICH CAN REACH YOUR SCREEN MUST BE REFLECTED BY THE MIRROR!

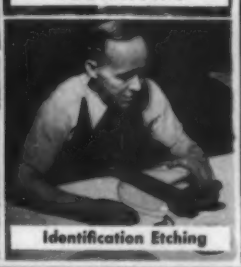
Endeavouring to make up light loss through the use of more current is pure waste, costs much more in power bills than periodic replacement of reflectors.

Strong Precision Reflectors, long recognized for their superiority, are carefully produced in types and sizes for use in all standard projection arc lamps. They are regularly stocked for immediate factory shipment.

THE STRONG ELECTRIC CORP.

31 CITY PARK AVENUE

TOLEDO 2, OHIO



STRONG REFLECTORS

surface for drive-in screens. Beaded screens are "specular," but unlike aluminized screens, they throw the light back in the same direction from which it came. The so-called Scotchlite surfacing used for making road-signs more visible when illuminated by auto headlights, has the same reflecting characteristics. Scotchlite screens would be ideal for drive-ins having a comparatively narrow viewing area.

To conclude, we believe that you can increase your screen illumination substantially by (1) using glass mirrors, (2) painting your screen with white paint made for drive-in screens, and (3) making a slight increase in your arc voltage, if this can be done. The use of an 8/7 mm carbon trim is an alternative which might possibly give a slight increase in screen light.

By CHARLES E. HAHN

J. E. McAULEY Mfg. Company

ANALYZING the projection situation at the Pat Drive-In Theatre, strange as it might seem, I believe that their present light source (if they eliminate their existing light losses) will result in sufficient light gain to give them a very well-illuminated CinemaScope picture of the size they intend to use—35 x 78 feet.

First of all, they are using a metal reflector, and this means an immediate loss of 20 to 25%. This reduced volume of reflected light is then projected through a barrel-type shutter which, in the writer's opinion, passes 38.7% of the already reduced total light. From the aperture, it passes through an *F*/2 projection lens, which at the focus he uses (4-inch) passes approximately 12 to 15% less light than would the same focus lens having a speed of *F*/1.8.

Now, let's see what all of these losses add up to. To begin with, the metal reflector-arc Mr. Elzey is now using would. if he had used a glass reflector, produce 15,000 screen lumens, according to the manufacturer's statements. The 20-to-25% loss that immediately takes place with the use of a metal reflector brings this total screen lumen count down to 11,625.

Now, since his barrel-type shutter passes only approximately 38.7% of this amount of light, he is now passing through the aperture only 4,500 lumens. Finally, because he is using an *F*/2 projection lens, accounting for another 12% loss, his total screen lumen figure is further reduced to 3,960. Thus, in his present set-up he is getting a loss of 11,040 lumens from a possible total of 15,000.

In changing to CinemaScope, the writer suggests that Mr. Elzey put in a new projector mechanism having an efficient revolving-shutter arrangement, an *F*/1.8 projection lens, and use a silvered reflector. He will then probably find that he has made a sufficient "for free" gain in illumination to produce a CinemaScope picture of the size he mentions. Possibly, this picture will be better illuminated than the level he is now obtaining with his present set-up and a 1.37/1 aspect ratio picture field.

By FRED C. MATTHEWS

Motiograph, Inc.

DRIVE-IN theatre owners who have increased the width of their screens to 100 feet or more should make immediate plans to whiten and resurface their present screens.

To best present CinemaScope productions and other wide-screen pictures, it is suggested that screens be increased in *both* height and width. For example, a present 30 x 40-foot screen should be increased in the proportion of 50 x 102-feet, if the theatre is to show a 2/1 image just as wide as a CinemaScope picture. If, however, it is wished to show only CinemaScope pictures to the full width of the screen, the height of the screen need not be increased in proportion mentioned above. The size of the screen and its proportion is a matter of individual taste.

Having arrived at the desired size and proportion of your screen, the next problem is to determine what is required in screen surfacing materials and finish. Most new screens have been resurfaced in "Transite" or plywood and finished with 3 coats of white paint similar to that made by Raytone Screen Co. There have been also a few screens refinished with an undercoat of aluminum paint and a second coat of white paint. The writer has seen screens finished with both types of paint, and screen results were quite satisfactory.

Some companies are offering both fibre glass and aluminum screen materials for resurfacing screens. Opinion on the respective merits of these materials is divided.

The change in the size of the picture will require a new set of projection lenses, and if pictures with varied aspect ratios are to be shown, more than one set will be required. It is recommended that fast anti-reflection coated lenses be purchased, as the use of cheap "slow" lenses could nullify some of the light gained from the use of higher-amperage arclamps. CinemaScope pictures require anamorphic lenses. There are at least 6 brands of such lenses available (fixed condenser-type and variable).

The most important item of equipment needed is new arclamps. Regardless of all claims of screen reflectivity, it is absolutely essential to have high-powered arclamps. There are only two types of arclamps that offer anywhere near sufficient screen illumination for screens in excess of 30 feet wide:

1. Reflector-type arclamps with rotating, positive-carbon mechanisms operating at 85 to 135 amperes.
2. Condenser-type arclamps operating at 160 to 180 amperes.

The reflector-type lamps, while vary-

(Continued on page 30)

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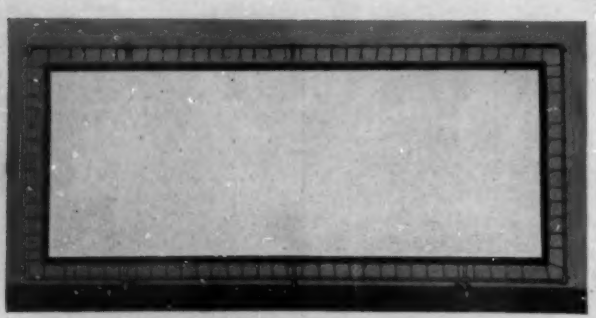

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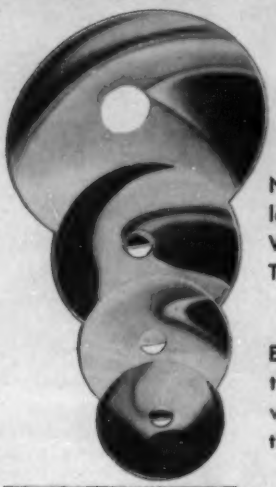

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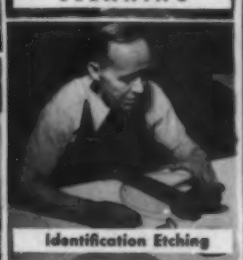


STRONG REFLECTORS

The New Kollmorgen F/1.7 Lens

By MARK STEVENS

BECAUSE OF THE well-established trend toward larger and wider screens, projectionists and exhibitors are devoting more attention to the projection lens than ever before. The demands made on the lens by wide-screen processes and drive-in projection are becoming increasingly severe. To meet today's exacting projection needs, Kollmorgen has designed a new ƒ/1.7 Super Snaplite lens.

The advent of a lens as big, as "fast" as ƒ/1.7 is indeed exciting news. The availability of this new ultra-speed lens in two forms that successfully overcome the optical difficulties previously experienced with extra-powerful lenses is an important advance in projection technology.

Projection lenses of ƒ/1.7 speed are an indispensable ally of the newer, more efficient arclamps and of such resolution-improving photographic processes as Paramount's VistaVision. Lenses faster than ƒ/1.7 are not feasible in the focal lengths most frequently used because of the mechanical restrictions of theatre projectors.

New lamps, alone, are not enough to provide adequate illumination on today's large screens. Even ƒ/1.9 and ƒ/2.0 lenses. although representing a tremendous improvement over the old-style uncoated "slow" lenses, do not utilize all of the light that passes through the aperture. Modern lamp mirrors are so fast (ƒ/2.0 in the case of a 16-inch mirror 32 inches from the film plane) that the light emerging from the aperture "spreads out," or diverges, to such a degree that even an ƒ/2.0 lens fails to intercept all of it.

The "regular" new Kollmorgen F:1.7 projection lens. Applicable data elsewhere in this issue.

Light Now Wasted

Contrary to general opinion, an ƒ/2 projection lens *does not* "match" an ƒ/2 mirror.* When the lens has an equivalent focal length (E.F.) of 3½ inches, it must have a "speed" of approximately ƒ/1.2 in order to match *perfectly* the ƒ/2, 16-inch mirror. Mechanical limitations prevent us from using a lens as big as this; but the new Kollmorgen ƒ/1.7 lenses approach the theoretical matching speed so closely that they may be regarded as effectively establishing the desired condition of perfect optical match.

This statement is valid because the outermost zones of illumination which would be picked up by the rear element of a perfectly-matched lens are comparatively dim and discolored. In nearly every case, therefore, the new Kollmorgen ƒ/1.7 lens utilizes and transmits to the screen practically the same amount of light that would be transmitted by a theoretically perfect lens.

Not only is light wasted when modern lamps are used in conjunction with old, "slow" lenses, but a "vignetting" occurs which results in a noticeable decrease of light at the sides of the screen. This hot-spot effect, caused by failure of a small-diameter lens to intercept the rays of light thrown forward from the marginal zones of the mirror, was first brought to the attention of the craft by Dr. Maulbetsch of the Kollmorgen organization.**

It is obvious that lenses of sufficient speed are absolutely necessary for bright, uniformly-illuminated pictures. But this is not all. The pictures on our new, wider screens are magnified more highly than ever before. And to make matters more difficult, the tiny film-photographs are smaller than ever before, their height having been reduced by the new apertures employed for non-anamorphic, wide-screen projection.

Emulsion-grain, poor photographic focus, and unsteadiness of the image are among the defects which are unfortunately magnified along with the desirable pictorial detail.

Finer-Grained Prints

Faulty photographic focus of the images in the film print is gradually being eliminated by greater care in photographing the negative and printing the positive. Graininess of the image, due to the comparatively coarse grain of the negative emulsion,

The X-tended new Kollmorgen F:1.7 lens. Applicable data elsewhere in this issue.

* The formula for lens matching is given on page 16 of IP for April 1954.

** "Uniform Screen Illumination as Related to High Speed Lenses," IP for September 1947, p. 5.

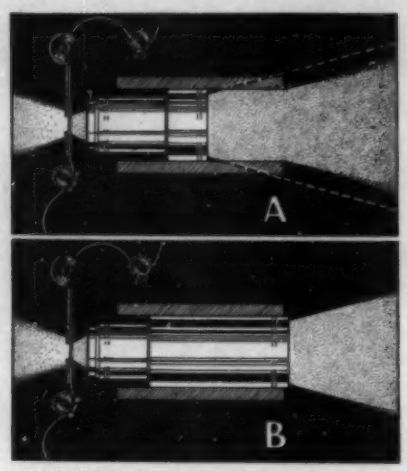


FIGURE 1

(A) The excessively long lens-holders of many modern projectors cut into the light beam thrown forward by "fast" lenses of short focal length, wasting light. (B) The new "extended" f/1.7X Super Snaplite lenses eliminate vignetting and loss of light due to shading. The secret—a long lens-assembly which "pipes" the light to the opening in the front of the mechanism.

is reduced by the VistaVision process, which employs a negative frame approximately 1.7 times the width of the standard 35-mm positive frame.

Picture at Mercy of Lens

The pictorial record impressed on the film, however, is at the mercy of the projection lens, the "neck of the bottle."

Many of the older lenses, even though of inadequate size and uncoated, produced screen images of an acceptable degree of clarity. This was often the case with lenses having long focal lengths — 4½ inches and longer — but in the shorter focal lengths the old-style lenses failed to give a satisfactorily sharp image near the edges of the picture (flatness of field).

The older lenses were of the type known as "Petzval aplanats," and consisted of two elements — 4 lenses arranged in the form of two achromatic doublets. Aplanatic projection lenses in improved form, and with the surfaces of the lenses anti-reflection-coated, still are made and give excellent performance in the longer focal lengths. The Snaplite Series II is a family of excellent aplanats of modern construction. These are rated as *f*/2.0 from 3½ to 5 inches E.F., and slightly slower in the longer focal lengths to 9 inches.

While wide-screen projection does not *necessarily* require the use of "wide-angle," short-focus lenses, it does in most cases. It all depends on what E.F. (equivalent focal length) is used for standard ¾-proportioned pictures. If, for example, 6-inch lenses were used for regular projection, the change to an aspect ratio of 1/1.85 will necessitate the use of 4½-inch lenses, the height of the picture remaining approximately the same. A 4½-inch lens is not a short-focus lens, a term usually applied to lenses of 3¾ inches E.F. or less.

Wide-Screen Requirements

In most theatres, however, conventional projection requires the use of lenses from 4 to 5 inches E.F. To change to wide-screen projection in such theatres, especially if the more extreme aspect ratios are desired, lenses of short focal length are needed.

Lenses are much too important a part of the projection installation to be selected haphazardly and without consideration of anything *except the focal length required.* As a matter of fact, a change of lenses provides an excellent opportunity to effect a substantial improvement in projection — in picture clarity, brightness, and uniformity of illumination.

Lens Coating Important

The optical design of the new lenses to be purchased, the presence of an adequate anti-reflection coating on all glass-to-air surfaces, and the speed of the lenses are factors which should be considered, together with quality and mechanical construction. The sharpness of the projected picture depends on optical design, the "crispness" and brightness of the images are assisted by the anti-reflection coatings, while picture brilliance and evenness of illumination are dependent on the speed, or diameter, of the lens.

Most modern lenses are 4-element (6-lens) "Gaussian doppelanastigmats," a type exemplified by the Super Snaplite families of *f*/1.9 lenses. These are highly recommended in the short and medium focal-length ranges, from 2 to 4½ inches E.F. Their superiority over the simpler aplanats lies in their wide, flat field which insures an extremely sharp picture over the entire surface of the screen.

The "hot-spot" effect of vignetting, due to insufficient lens diameter, is at a low level with *f*/1.9 lenses. But with the new *f*/1.7 Kollmorgen lens it is at an irreducible minimum! The use of the *very fastest* lenses — those of *f*/1.7 speed — is the easiest, least expensive way to inject a new brilliance and lifelike clarity into the screen image.

"Smoothing Effect" Noted

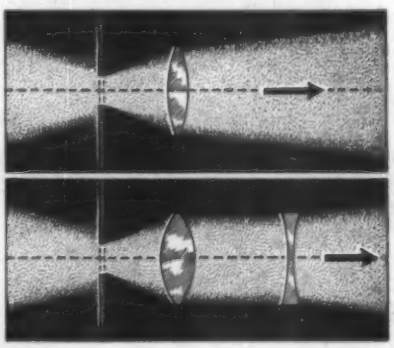
Because of their greater diameter and unusual optical design, these ultra-speed lenses not only make the picture brighter and clearer, but they also exert a "smoothing effect" on the light which results in a uniform field of brilliant illumination even on the largest screens. And the new *f*/1.7 Kollmorgen lens is available in focal lengths even as short as 2 inches!

The remarkable performance of the *f*/1.7 lens in the later projector mechanisms is not due to their high speed alone. For use in the older projectors having lens-holders extending about 6½ inches from the film-plane (Simplex Regular, Gardiner, Century K, Motiograph F and H, Wenzel, *etc.*) the BX-290 series of the *f*/1.7 lens is available. This series includes focal lengths from 2½ to 4 inches in ¼-inch steps. In optical design, these lenses are improved Gaussian doppelanastigmats, larger in diameter and more light-transmitting than any other lenses available for theatre projection.

With most other projectors, including the Super Simplex, Simplex E-7 and X-L, Superior A and U, Brenkert BX-40, BX-60, and BX80, Century C and CC, DeVry, Motiograph K and AA, and the later Wenzel models, it is necessary, when ordinary short-focus lenses are used, to place

FIGURE 2

The action of a "regular" projection lens on the rays of light emerging from the aperture is shown in the upper diagram. A single convex lens is used to illustrate the principle involved. The action of an "extended" f/1.7X Super Snaplite is illustrated in the lower diagram by two simple lenses, an optical system resembling a Galilean telescope pointed toward the aperture. Note that the rays between the two components are essentially parallel, effectively "piping" the light through a long lens-holder.



Basis for High-Speed Optics

The larger picture area requires additional light. This being so, an f/1.7 lens, as compared with lenses of slower speed, is a distinct advantage, because it delivers to the screen an eye-filling 23% increase in light.

It is understood, of course, that unless the entire optical train from reflector or condenser set-up be in proper alignment, the advantages accruing from any fine optics will be dissipated. "High speed," optically speaking, is of no value whatsoever unless the other elements in the projection train (particularly the working-distance from either the reflector or the condenser combination) are in proper order.

Unless the entire optical train be in proper alignment, the best lens in the world will deliver unsatisfactory projection screen results.

"shade tubes" on the front of the lenses. The purpose of a shade tube is merely to extend the lens barrel sufficiently to meet the projector lens-holder which clamps the lens firmly in place.

Mechanical Limitations

The use of shade tubes on "fast" (large-diameter) short-focus lenses, although necessary to hold the lenses in place in these machines, creates a special difficulty, as does the relatively great distance between film-plane and the front of the mechanism. This distance is about 10½ inches in most modern projectors. Both the shade tube and the opening in the front of the mechanism actually cut into the light-beam issuing from the front element of the lens, reduce the illumination drastically, and produce a vignetting similar to that caused by too small a lens.

The obvious remedy consists of modifying the lens-holder and enlarging the hole in the front of the mechanism to accommodate lenses 4 inches in diameter, but this expedient is not always feasible. An alternative solution of the problem lies in a special lens design which "pipes" the light through the narrow opening, keeping the rays essentially parallel until they emerge from the front element of the long lens-assembly. This is what Kollmorgen optical designers have done in the 294X series of f/1.7 "extended" Snaplite in the focal range of 2 to 3 inches, inclusive, in ¼-inch steps.

The production of the ultra-fast f/1.7 *extended* Super Snaplite projection lenses ranks with VistaVision and the improved high-intensity arc as a contribution to projection quality. The replacement of outmoded short-focus lenses with f/1.7X Super Snaplites in modern projector mechanisms results in an improvement immediately apparent.

Immediate Improvement

The f/1.7 Super Snaplites, then, are ultra-rapid, high-quality projection lenses of relatively short focus available in two forms — the "regular" BX-290 short-barrel series for the older mechanisms, and the "extended" BX-294 long-barrel series for the newer mechanisms. Shade tubes are not needed for the "extended" lens.

Large screens are here to stay, no matter whether wide-screen aspect ratios are employed for extending the horizontal angle of vision, or whether the normal 1/1.375 aspect ratio is retained for a more spacious pictorial format. Either way, short-focus lenses are needed in most theatres to give the required size to the projected pictures.

The lens-holder and associated focusing carriage must be regarded as extremely important parts of the projector mechanism, despite the fact that their construction is quite simple. No lens can function properly unless

Lamp Manufacturer Assays Screen Surfaces

By CHARLES E. HAHN

J. E. McAuley Mfg. Co.

WE want to make it perfectly clear that we take no arbitrary stand on the question of the superiority of flat, curved, non-reflective or reflective surface screens. Nor do we agree that it is sound reasoning, especially from the exhibitor's viewpoint, to take a position that under all and every projection situation, only one particular type of screen is preferable to all others.

Unbiased Outlook Needed

When an unequivocal position of this kind is assumed, one would be justified to enquire to determine if there was not a special reason or motive behind it, because the motive might actually turn out to be something other than the claimed superiority of a picture projected upon that particular type of screen.

An attitude of universal and unquestioned acceptance of such counsel could enforce the purchase of new arclamps, rectifiers, or generator equipment, (with higher operating costs thereafter) which in dollars represents an investment far above and beyond that of simply installing a different type screen to obtain a picture of equal quality and possibly higher brilliance.

In analyzing a polar curve indicating the reflectance of a flat and/or matte white surface, it must be acknowledged that at least 75% of its reflected light actually reaches areas within a theatre where it is physically impossible to seat spectators, hence is totally wasted. We mean, of course, directly downward toward the floor, directly upward toward the ceiling, and directly sidewise away from both sides of the screen.

As this characteristic of flat, matte surfaces, is an established fact, doesn't it then seem completely illogical to categorically claim that such a screen is the only one that should be used in *all and every* type of projection situation? Further, doesn't this line of reasoning infer a defeatist attitude by creating the impression that nothing can be done about it, especially in the face of the endless variety of polar curves which it is possible to obtain from various types of reflective screen surfaces?

Many Types Available

To our knowledge, there are many very fine and distinctly different types of screens available today, and it is only a matter of selecting the right one to suit a given projection condition. We refuse to accept the hidden assumption that reputable manufacturers of these screens, and their sales agencies, would purposely recommend to an exhibitor a type of screen that would be totally unsuitable for the theatre in which it was to be installed.

it is held solidly and square to the aperture, the optical axis of the lens coinciding with that of the mechanism and lamp. And what better time is there to check up on the condition of the lens-holder and focusing arrangement than when changing to new lenses?

Watch Optical-Train Alignment

The lens-holding components of the older mechanisms, especially if rebuilt or modified to take larger lenses, may be seriously out of alignment, ruining the performance of sensitive, fast lenses. The use of cardboard or odd scraps of sheet metal to shim the lens-barrel in off-size holders may throw the lens out of line, making it impossible to get a good focus. The "haywire" shims should be replaced with adapters or other fittings recommended by the manufacturer of the lens.

The faster a lens and the shorter its focal length, the smaller its "depth of focus." This means that the focusing of the picture on the screen is a more critical operation than it was in the days of slow, long-focus lenses. Then, too, focusing is always more critical with lenses of the best quality and requires more exacting projection technique. Poor lenses fail to bring the projected image to knife-edge sharpness, and the best focus obtainable with them is fuzzy at best. Such a lens may be moved through a considerable distance without any perceptible change in the clearness of the image.

The new series of Kollmorgen *f*/1.7 Super Snaplites (the "regular" for older mechanisms and the "extended" for the Super Simplex and most later machines) gives so much evenly distributed light at the screen, as well as a flatter field of crystal-clear definition, that a thorough checkup of the projectors and the installation of heat filters when necessary will insure screen results unsurpassed for radiant, lifelike quality.

Par's Electronics Splurge

Paramount as of Jan. 2 this year had investments in and advances to affiliates engaged in research and development of Tv and electronic facilities and equipment amounting to $4,223,250. The investment in 560,000 shares of Allen B. Du Mont Laboratories Class B and 43,200 shares of Class A common, is carried at $164,000.

This Matter of "Balanced Lenses"

Word comes from Berlin that Eric Palmer, noted cinematographer and director, has completed a feature picture using the Garutso lens. This news occasioned some eyebrow-lifting in technological circles with many observers being at a loss to classify properly the Garutso lens. To clear the atmosphere, IP appends hereto a report on this process which it published some years ago when the principle was first proposed.

GARUTSO "balanced lenses," credited by their sponsor with the ability to impart depth to photographic images, have received widespread and, on the whole, rather glowing sendoffs from the photographic trade press. The virtues of these patented lenses are described in the appended verbatim copy of a statement by their sponsor:

"A commercial set of Garutso lenses is comprised of 25, 30, 35, 40, 50 and 75-mm focal lengths. Inherent to all of them are unusual characteristics that set them far apart from conventional lenses of similar focal lengths.

"Variable Deep Field of Focus"

"First, instead of a *single plane* of focus, Garutso lenses have a variable and tremendously deep *field* of focus. This depth of field results from Mr. Garutso's discovery of new principles and is in no wise produced by special diaphragm apertures or tricks of any kind. The variability of the field is controlled by focus adjustment entirely.

"A number of different Garutso lens formulae have been developed for the modification of conventional photographic objectives of different types and focal lengths. While these formulae differ among themselves, they all embody the same optical-balance principles.

Assert Two Major Improvements

"In general, the Garutso modification accomplishes two major improvements: (1) the focal depth of the modified objective is increased, and (2) the definition and contrast of the image is greatly enhanced by a substantial reduction in the vestigial spherical aberration of the conventional lens. Previous attempts to accomplish the increase in depth of focus, first above-mentioned, have had no success because the modifying elements used have introduced other undesirable aberrations.

"The diaphragm, instead of being used to create an illusion of increased focal depth by means of small apertures as in a conventional lens, is employed in the Garutso lens to increase the plasticity of the photograph, thereby intensifying the three-dimensional effect. The Garutso balanced lens provides a negative of uniform density throughout the entire field at all apertures."

Following careful consideration of the foregoing, as well as of other data relating to the Garutso lens, IP is constrained to make the following observations:

Optical Limitations

For a given sharpness of image at a given focal length of the lens and a given aperture, *all* lenses have and *always will have* a given depth of focus.

There are three methods by which one may achieve depth of focus: (1) reduce the focal length of the lens; (2) diminish the size of the aperture, or (3) reduce the sharpness of the image. This last-named condition would seem to be a major function of the Garutso lens, with results that were strikingly apparent in the motion picture "Citizen Kane," produced by Orson Welles many years ago (1938).

The foregoing is as much a natural law as is the fact that if one stepped out of a ten-story window the chances would be excellent that one would break his neck. We need not confuse this issue with considerations of aperture opening, lens speed, or the amount of light on a given set. These fundamental laws prevail and are at once controlling and incontrovertible. —even in Hollywood.

It is an astonishing thing that nobody in Hollywood has yet lent acceptance to the principle that we shall reduce the sharpness of the *foreground* images.

New DuMont Tv Color Tubes

DuMont has announced that large screen, color Tv receiver tubes will be available for use by the Fall of the year. The tubes will produce a picture 185 square inches, according to DuMont, which would make them roughly equivalent to a 16-inch tube in picture size.

The VistaVision Horizontal Projector

To improve VistaVision screen image in large theatres and drive-ins, Paramount and Century design equipment to project film image more than twice standard size.

By JAMES MORRIS

THE LATEST of the new processes is a projection method designed to pull motion picture film from side to side so that a film image equal in size to more than two standard film frames can be utilized. Designed to complement Paramount's VistaVision camera system, this new projector has been installed in New York's Radio City Music Hall where it is being used to present the picture "White Christmas."

Right at the start, however, it should be stated that the new projector, which is to be manufactured by Century Projector Corp., is not designed to fill the needs of all theatres. According to Paramount, only 100 indoor theatres in the United States are large enough to make profitable use of the new projector — and these have screens over 50 feet wide. In addition, horizontal projection may also become important to the larger drive-in theatres.

Aperture Much Enlarged

The way the VistaVision horizontal projector works is shown in the accompanying illustrations. The projector head designed by Century is layed on its side so that the film is pulled horizontally instead of down, and a film area eight sprocket holes in length instead of four is pulled with each movement of the film. Film speed is 180 feet per minute, and 4000-foot reels are used.

A special projector gate with an enlarged opening and a much larger aperture plate made it possible to project a film image of 1.418 by .722 at the Music Hall instead of the conventional aperture of .600 by .825. The result is a sharper and brighter screen image, since the magnification of the image on the screen is less than half as much and more light is able to reach screen.

The VistaVision horizontal projector was developed in order to more fully utilize the potentialities of the VistaVision camera process developed by Paramount. This camera process also involves pulling the film sideways through the camera and exposing a negative roughly equivalent in size and position to that of the familiar 35-mm miniature still camera. This larger negative is then reduced in size and placed in the standard position on 35-mm film stock by an optical printer. That's the standard VistaVision process which will continue to be used in making the VistaVision prints for most theatres.

Since the graininess of the negative had been the principal barrier to achieving sharper motion picture prints for large-screen projection, it is possible to get a sharper print by using the VistaVision camera and large negative. Negative films have to be faster (more sensitive to light) than the positive print films which are exposed only under the highly controlled conditions of the film laboratory. The slower but more fine-grained positive print film used in the laboratory is capable of retaining most of the sharpness of the large negative even when the film image is reduced in size to fit the standard projection aperture.

Not Enough Light

There is an important objection, however, to the use of this standard VistaVision print in some theatres. When projected with the further reduced aperture used in wide-screen projection, the resulting screen image retains considerable sharpness, but it is not bright enough to give really first-class results on a giant screen. Also, less magnification of the film image would further sharpen the giant-screen picture.

Showing the horizontal projector in use at the Radio City Music Hall. The white arrow points to the projector head outlined in white. The head is repositioned so as to lie on its side. Note that the magazines are in a vertical position but not directly above and below the projector as in standard models.

Sharp Image Obtained

For this reason Paramount resorted to the idea of making contact (same size) prints from the big VistaVision negative and projecting them in the same way that the picture was taken —by pulling the film from side to side. In addition to producing an extremely sharp screen image, this method permits considerably more light to reach the screen.

Those who witnessed the Music Hall showing — the first time since the early thirties that a much enlarged film image was used to improve theatre projection — were much impressed by the results. On a screen approximately 60 feet wide and 32 feet high, the Music Hall projectors placed a sharp, bright image that was considerably better overall than what could be achieved by using a conventional

film image which is less than one-half as large.

Sharpness Greatly Increased

The clarity of the picture presented at the Music Hall was extremely good, but it also had some questionable characteristics due, most probably, to the fact that the projectors used were really experimental hand-tooled models put together in a very short time to meet the deadline for the opening of "White Christmas" which is, incidentally, the first picture made in the VistaVision process. There was a sidewise "jiggle" or unsteadiness on the morning of the opening that was particularly noticeable in the titles. Also, the screen did not seem as brightly lighted as one might expect since it was predicted that the enlarged aperture would permit the passage of as much as 100% more light.

The unsteadiness of the picture seemed to pass later in the showing. Loren Ryder, technical head of Paramount, who was present, said that the condition was corrected by an adjustment of the gate tension and the intermittent. The brightness of the picture was less than one might expect, it was said, because technicians at the Music Hall had deliberately reduced the light because they felt that the color balance of the arclight resulted in the best rendition of color on the screen at about 150 amperes. It was also felt that the picture was too bright when 170 amperes of current was used to project the larger film on the screen used at the Music Hall. Since the first showing the amperage has been stepped up somewhat.

There is no doubt, however, that enlarging the film-image area is the most logical method of improving the quality of giant-screen pictures. According to Larry Davee, sales manager and engineer for the Century Projector Corp., the two hand-tooled projectors used in the Music Hall were designed and built within 2½ weeks to meet the deadline. There just wasn't time for perfect results.

In constructing the projector a number of mechanical problems came up. One involved the intermittent mechanism which could not stand the strain imposed by a heavy 32-tooth sprocket at a film speed of 180 feet per minute. A new star cam and sprocket had to be engineered before the projector could be relied on to stand up under operating conditions.

Big Reels a Problem

Another problem concerned the 4000-foot reels used in this high-speed horizontal projection. Ordinary take-up reels tended to develop so much momentum at this speed that they snapped the film. The requirement was for a free wheeling reel in perfect condition. The problem was resolved by designing a type of free-wheeling reel in which the movement of the flanges was completely free of the movement of the hub.

Davee went on to say that the faster film speed of horizontal projection would be a boon to sound reproduction, suggesting that an optical track running at this speed was capable of attaining a response of 16,000 cycles per second. There was no doubt in his mind that such a fast-traveling optical track was superior to present-day optical and magnetic sound-on-film methods, and capable of providing a wider sound range response than any presently available theater reproduction equipment is capable of responding to. For the Music Hall showing sound was on a separate film and run through a separate synchronized projector at 90 feet per minute.

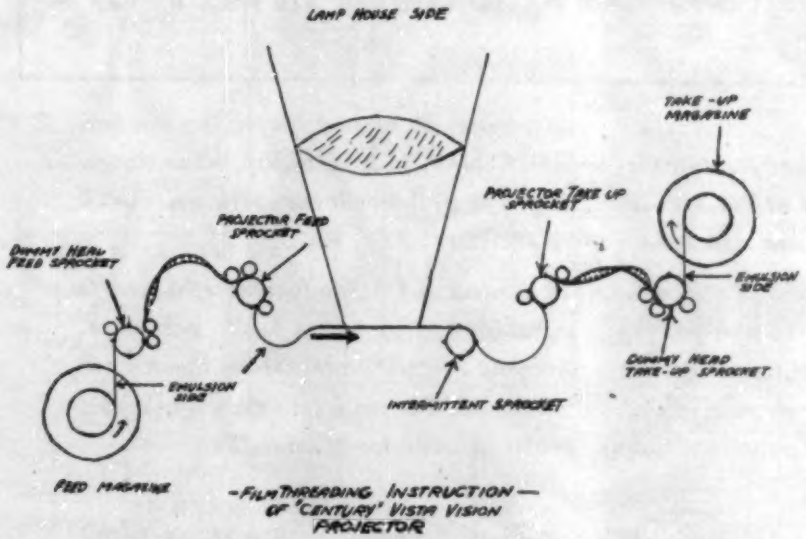
For some reason the Paramount people who have publicized the horizontal projector have not stressed its value as a means of increasing light at drive-in theatres. It was primarily in response to questions by reporters that Loren Ryder discussed the question after the opening. However, he stated that he felt it would be possible for a drive-in to increase its light as much as 100% by means of the new projection system. Larry Davee was not quite as optimistic when interviewed by IP. He estimated that the new system might be capable of increasing light transmission by about 40% using present arclamp equipment. With specially designed arclamps an improvement as great as 100% should certainly be possible.

Film Buckle Increases

The crucial question concerning the design of projection systems using a larger film image and a more powerful light source is the problem of film buckle, according to Ryder. He states that the amount of buckle increases with the square of the width of the film. For instance: a 70-mm film would be likely to buckle four times as much as 35-mm film—not twice as much. This characteristic tends to counteract the benefits obtained by spreading the light over a wider film area.

Ryder and Davee both state that

(Continued on page 27



—FILM THREADING INSTRUCTION— OF 'CENTURY' VISTA VISION PROJECTOR

Here is the drawing which provided the guide for the Music Hall projectionists for threading the VistaVision horizontal projector. IMPORTANT: on the actual projector the feed and takeup magazines and the extra sprockets (32-Tooth) are positioned differently. The film magazines are positioned vertically as in a standard projector but they are offset to the side. The extra feed and take-up sprockets redirect the path of the film. The points at which the film twists are shown. The soundtrack for the Music Hall showing was carried on a separate film which was run on a standard 35-mm vertical-pull projector interlocked with the VistaVision horizontal-run projector. This is a temporary expedient.

ANNOUNCING TWO GREAT NEW LENSES

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BOOTH 95
1954 TESMA SHOW

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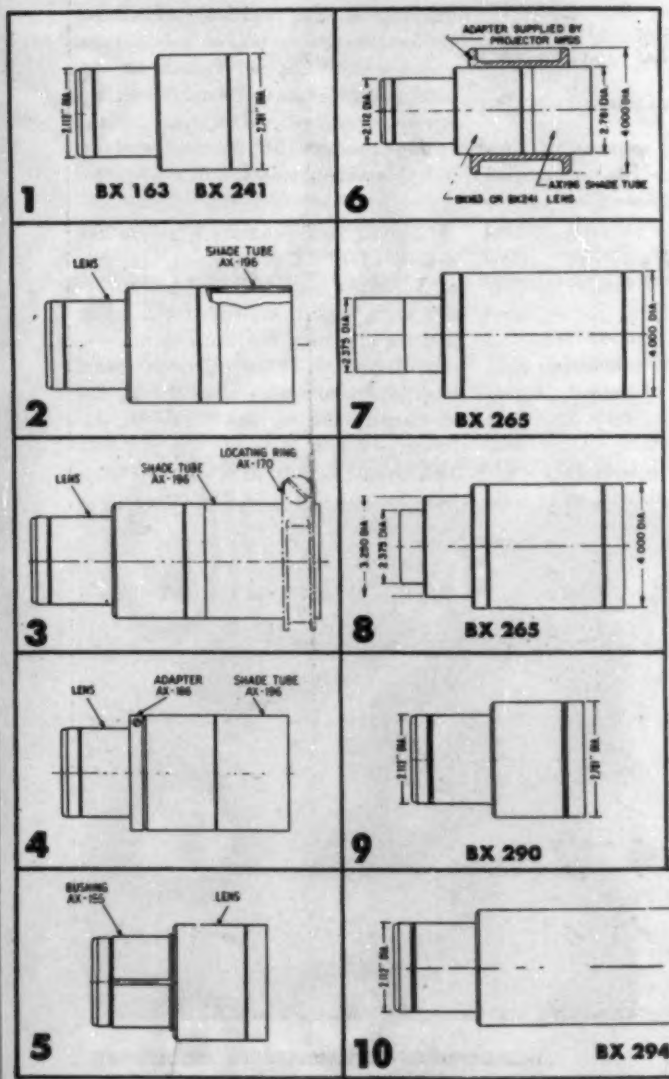
1. **Lens-fitting numbers as given in the table at the right.**
2. **Make and model of projectors.**

***IMPORTANT:* The F/1.7 *regular* lens is available in sizes from 2½ to 4 inches inclusive in ¼-inch focal length steps. The F/1.7X (extended) is available in sizes from 2 to 3 inches in ¼-inch steps.**

BE SURE TO SPECIFY THE FOCAL LENGTH



PROJECTOR		SUPER SNAPLITE f/1.9 (BX241) SUPER SNAPLITE f/1.7 (BX290) SNAPLITE SERIES II (BX163) STANDARD BARREL			
Make	Model	Fittings	Fig. No.	Notes	Recommended f/1.7 Lens Number
Ballantyne	"W"	None			290
Ballantyne	"W" Large lens mount	AX-155	5		290
Ballantyne	"G" (Gardiner with reg. lens mount)	None			290
Ballantyne	"G" (Gardiner with large lens mount)	AX-155	5		290
Ballantyne	4" dia. mount	AX-196	6		290
Brenkert	BX-40, BX-80 BX-60, BX-62	AX-196 AX-170*	3		294
Brenkert	RCA 100	AX-196	6		290
Century	C, CC, K Super	AX-196 AX-166	4		290
Century	C, CC, K Super (Using 2 clamp rings)	AX-196 AX-166	4		294
Century	K (or Kaplan)	None	1		290
Century	K with C-62 modification	AX-155	5		290
Century	4" dia. mount	AX-196	6		290
Holmes	Type B, Educator	AX-196	2	Will take lenses 5" E.F. and longer only	290
Holmes	Type G.P.	AX-196	2		290
Holmes	Type D	AX-196	2	Will take lenses 5" E.F. and longer only	290
International Projector Corp.	Simplex E-7	AX-196 AX-170*	3		294
International Projector Corp.	Simplex, Regular	None †	1		290
International Projector Corp.	Simplex, with C-62 modifications	AX-155	5		290
International Projector Corp.	Simplex International	None	1	Will take lenses 4" E.F. and longer only	290
International Projector Corp.	Simplex Semi-professional	AX-196 AX-170*	3	Will take lenses 4" E.F. and longer only	294
International Projector Corp.	Super Simplex	AX-196 AX-170*	3		294
International Projector Corp.	XL	AX-196	6		290
Motiograph	AA	AX-196	2		294
Motiograph	F	None	1		290
Motiograph	HU, HK, K Deluxe	AX-155	5		290
Motiograph	4" dia. mount	AX-196	6		290
Powers		AX-196	2	Will take lenses 5" E.F. and longer only	290
Powers	With heavy duty focusing front	AX-196	2	Will take lenses 5" E.F. and longer only	294
Wenzel	Pro-4, Pro-6	None †	1		290
Wenzel	Pro-4 with large lens mount	AX-155	5		290
Wenzel	4" dia. mount	AX-196	6		290

* Not regularly furnished, but can be supplied if desired.

† .0065" shims furnished at no cost when this projector is specified.

PROJECTOR		SUPER SNAPLITE (BX265) 4" Diameter Barrel		
Make	Model	Fig. No.	Note	Recommended f/1.7 Lens Number
Ballantyne	4" dia. mount	8	Shade — Tube AX-196 required if BX-163, BX-290 or BX-241 lenses are used. See Fig. No. 6	290
Brenkert	RCA 100	8		290
Century	4" dia. mount	7		290
International	XL	7		290
Motiograph	4" dia. mount	8		290
Wenzel	4" dia. mount	8		290

In The SPOTLIGHT

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

AFTER a year of negotiation, labor-management recently announced agreement on an industry pension plan covering 18,000 studio workers on the West Coast. This plan, involving 40 unions and guilds and 200 employers, becomes effective the 24th of this month. The agreement specifically includes member companies of the Ass'n of Motion Picture Producers, Society of Independent Motion Picture Producers, Independent Motion Picture Producers Ass'n, and the Alliance of Television Film Producers.

Payments to this pension fund will be made by both labor and management, each contributing two cents for every "straight time" hour worked. However, employer contributions are retroactive to October 26, 1953, when negotiations first began, while employee contributions will start October 24, 1954.

In order to allow sufficient time in which to build up an adequate fund, the first possible pension payment of $20 per month will be January 1, 1960. A worker eligible for a pension must be 65 years old and have worked a minimum of 20,000 hours and 20 "qualified" years in the industry. A "qualified" year is one in which the employee has worked at least 400 straight-time hours.

Employees eligible for individual company retirement plans at Loew's, 20th Century-Fox, and RKO may choose between the company and industry pensions, but they cannot participate in both.

A board of 16 directors, equally divided between labor and management, will administer the plan. George J. Fiaherty, IA West Coast representative and business representative for Hollywood Projectionist Local 165, was appointed chairman of the first board. Other IA board members are James D. Tante, Local 728; Herbert Aller, Local 659; Alan Jackson, Local 633; John Lehners, Local 727. Representing AF of L unions other thanæ IA are board members Ralph H. Clare, Henry C. Wadsworth, and Norman Lowenstein.

● Charles Vonesh, member of Chicago Local 110, has been appointed head of the Motiograph field service department. He succeeds J. W. Huckleberry of Local 281, Paducah, Ky., who has joined Motiograph's engineering department.

● The recent SMPTE convention contained so very little practical projection material and so very much of the other arts — notably Tv, color, radio — that the importance of IA technicians keeping abreast of technical developments must be emphasized anew (see the article by Merle Chamberlain — "Past, Present — and Future?" in last month's IP).

● Benefits paid by national and international unions affiliated with the AF of L for the year 1953 totaled $107,346,178.79, according to the report issued by the Federation's executive council at the recent 73rd convention.

● Clifford Vericker, member of Detroit Local 199, was installed as commander of the Russell Johnson Theatrical Post No. 371 of the American Legion. This post meets at midnight the first Tuesday of each month.

● Speaking of Rochester Local 287, two of its members, Thomas Moore and Raymond Hansen, were injured while installing a wide screen at the State Theatre in Aliquippa, Penna. Moore lost his balance and fell from the top of the scarffold, sustaining six broken ribs, a broken pelvis bone, and a fractured spine. He will be hospitalized for at least five months. Hansen was injured when one of the falling speakers hit his foot and inflicted severe bruises.

● *Recent out-of-town visitors to the offices of IP:* Bob Milligen, member of Toronto Local 173, and his attractive wife, visited with us for a while and we cut up a few touches discussing friends. From Detroit came George Hickox who was driving up to Canada for a short vacation. Although Hickox is a member of Local 291, Grand Rapids, Mich., he has been working out of Local 199 jurisdiction for a number of years. Another vis-

TORONTO LOCAL 173 FOURSOME WINS COVETED GOLF TROPHY

The highly-prized N. A. Taylor trophy was won by the Projectionists' Recreation Club, comprised of members of Toronto Local 173, in the recent annual Canadian Picture Pioneers golf tournament. Mr. Taylor, president of CPP, is shown here (center) presenting the trophy to the IA men, left to right: Andrew R. Pura, Frank Cox, A. Byford, and Frank Cross, captain of the team.

itor was Morris Thacker, member of Chicago Local 110, who dropped in to say hello and to get the answer to a technical problem. We were glad to be of service and hope our solution put him on the right track.

• The annual Fall meeting of the New York State Association of Motion Picture Projectionists was held on October 4 at Ithaca, N. Y., with Local 377 acting as host. The meeting was high-lighted by discussions of new equipment and processes by representatives of several leading equipment manufacturers.

Larry Davee, sales manager and engineer for Century Projector Corp., detailed the fundamentals of the new horizontal projection method employed for the current presentation of the VistaVision picture, "White Christmas," at Radio City Music Hall, New York City. Messrs. Neumer and Mulroy of the Bausch & Lomb Optical Co. discussed wide-screen processes, which was followed by a question-and-answer forum. Arthur Meyer, vice-president and general manager of International Projector Corp., who is always a most welcome guest at projectionist gatherings, expressed his appreciation for the fine job projectionists are doing with the new processes. Bill Ingram (Rochester Local 253) displayed and explained the new variable anamorphic lens now available from Projection Optics Co. of Rochester, N. Y.

Election of officers closed the business sessions. The newly elected Association officers for the next two years are George Raaflaub (Syracuse L. 376), president; Earl Tuttle (Binghamton L. 396,), Harry Lackey (Utica L. 337), Henry Jeffrey (Cortland L. 272), vice-presidents; Charles F. Wheeler (Geneva L. 108), secretary-treasurer; E. Francis Larham (Geneva L. 108), George Robinson (Niagara Falls L. 121), Walter Scarfe (Syracuse L. 376), Charles Johnson (Binghamton L. 396), Robert King (Ithaca L. 377), members of the executive board, and Louis B. Goler (Rochester L. 253), sergeant-at-arms.

A feature of the midnight banquet, sponsored by host Local 377, Ithaca, was the presentation of a gold life-membership card to Cedric Carpenter for 43 years of devoted service to the Local. James J. Brennan, IA vice-president, made the award. Among the out-of-town guests were Morris I. Klapholz, secretary of the 25-30 Club, and Edward Dougherty, past president of the Club.

Dr. A. N. Goldsmith Honored by the NTFC

Dr. Alfred N. Goldsmith, now at the height of an extraordinary career which embraced teaching, inventive ability and splendid engineering talent in practically all phases of the technical arts (with particular emphasis upon the motion picture and television fields) was tendered a testimonial dinner recently by the National Television Film Council.

One of Dr. Goldsmith's most noteworthy achievements was the invention of the chromatic television system which has gained practically unanimous acceptance by the Tv industry. Dr. Goldsmith's activities are much too long to be recounted in detail here, but among other things he has been a special consultant to RCA, Eastman Kodak, Co., the Rockefeller Center realty development, and RKO Theatres.

Not the least interesting facet of Dr. Goldsmith's career is the wholehearted acceptance accorded him by the projection craft. When president of the SMPTE (and as a past president of the IRE) Dr. Goldsmith gave unstintingly of his time and talents to the advancement of the projectionist craft. Recognition of this fact will be readily apparent by reason of his being a gold-card life member of IA Local 306, New York City, and being accorded the same status in the 25-30 Club of Greater New York, Inc., an organization of veteran projectionists.

Dr. Alfred N. Goldsmith

N. Y. STATE ASS'N HONORS MEMORY OF WILLIAM CONNOLLY

A gold honorary membership card in the New York State Association of Motion Picture Projectionists was awarded to the widow of the late William Connolly, Local 535, Johnstown, N. Y., at the recent Fall meeting in Ithaca. Mrs. Connolly is shown at the extreme left of the photo above, standing between Charles F. Wheeler, secretary-treasurer, and Earl Tuttle, president of the Association. At the right are members of the Association's Ladies Auxiliary.

25 Years Ago — October 1929

● The IA General Executive Board convened at the Royal York Hotel in Toronto during the convention week of the AF of L . . . A 20-acre public park in Chicago was named in honor of the late Samuel Gompers. . . . At the AF of L convention in Toronto, Tom Maloy, business representative for Chicago Local 110 and delegate to the convention, was chosen to represent the American trade movement at the British Trade Union Congress annual meeting. . . . IA General Office issued a warning to its projectionist Locals against a number of so-called "Projection Schools," which came into being with the advent of sound.

An Evaluation of Optical Sound

This is the last of a series of three articles on the history and present uses of the photocell in theatre sound reproduction.

By ROBERT A. MITCHELL

THE PROCESS of manufacture for the conventional red-sensitive caesium-silver-oxygen cells is interesting. The semi-cylindrical cathode support is silver-plated and the surface of the silver oxidized by moist ozone (a chemically active form of oxygen) to a silver-oxygen compound known as silver peroxide.

Upon the silver peroxide is coated a very thin layer of caesium. This work must be done in a vacuum, the active caesium applied by vaporizing it and letting the vapor condense. When the caesium comes in contact with this surface, it takes part of the oxygen away from the silver peroxide to form caesium oxide.

With less oxygen, the silver peroxide becomes normal silver oxide, which gives the cathode its dull yellowish-brown color. A small amount of metallic caesium and silver remain in the coating, and it is believed that this trace of free metal increases the electrical conductivity of the surface. Now, this particular type of photosensitive surface readily emits electrons when exposed to red and infrared light.

Blue-Sensitive Cells

The cathode of the blue-sensitive cell is made by coating the metal plate with a very thin layer of antimony by the vacuum-evaporation process. Next, this antimony film is exposed to caesium vapor at a temperature slightly above the boiling temperature of water. A compound, caesium antimonide, is formed. This substance is a semi-conductor of electricity. Exposure of this surface to oxygen at low pressure for a short time increases the sensitivity of the cell, presumably by forming a trace of an active form of caesium oxide. The color of the surface thus prepared is bluish-gray.

Being sensitive only to blue and violet light, the caesium-antimony cell is reserved for use with natural-color prints having the soundtrack printed in colored dyes which transmit low red and infrared rays too readily to give good results with red-sensitive cells. Color films having such soundtracks are not, however, used in American theatres at the present time.

Soundtrack Dyes

The most satisfactory dye tracks are those printed in just one color. The blue-sensitive cell, however, requires a red soundtrack, which simply means a combination of two dye-colors, namely, lemon-yellow and magenta. Magenta alone cannot be used with blue-sensitive cells because magenta dye transmits both red and blue-violet light, screening off only the green of the spectrum. And yet a magenta track would be desirable due to the fact that the magenta layer of dye-coupler films (Eastman Color, Ansco Color, Agfacolor, and others) constitutes the "green record" and has excellent image-definition. Maximum response cannot be obtained from magenta tracks unless photocells sensitive only to green light are used.

Green-sensitive photocells have been devised. Examples are the strontium and caesium-bismuth cells. For maximum response from a magenta dye track a green filter, such as the Eastman Wratten No. 61, is placed in front of the cell to mask off any red or blue-violet rays that might produce a higher level of ground noise.

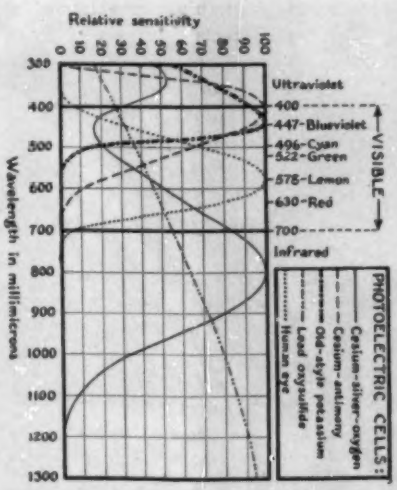


FIG. 5. Color-sensitivity of photoelectric cells.

The caesium-silver-oxygen (red-sensitive) and caesium-antimony (blue-sensitive) phototubes for sound motion-picture projectors are gas-filled, containing a trace of argon to step up the sensitivity five to eight times. For this reason the anode potential supplied to these cells should not exceed 90 volts.

Response Characteristics

The commonly used red-sensitive cells have what is called a Type S-1 response, the sensitivity-peak occurring in the infrared region of the spectrum. RCA phototubes IP40, 868, 918, and 930 are S-1 cells familiar to projectionists. RCA photocell 927 is a "little fellow" about two inches high used in 16-mm equipment.

Among the blue-sensitive cells intended for dye-track reproduction we find RCA cells IP37 and 5581. RCA cell 5583 is for 16-mm projectors. These cells have a Type S-4 response with the peak occurring in the far violet region.

The lead oxysulfide cell, most sensitive to the deep infrared, is the only *photoconductive* cell suitable for sound-on-film reproduction. Its frequency-response characteristics are quite similar to those of gas-filled photoemissive cells. The cadmium sulfide photoconductive cell, on the other hand, is "blind" to variations of light more rapid than 1000 cycles/second.

The light-sensitive plate of the lead oxysulfide cell consists of lead sulfide oxidized on its surface to lead oxysulfide. Metal electrodes contact this surface in such a way that current is forced to flow through the lead oxysulfide. When light falls on this surface, resistance of the cell to the flow of current decreases about five times.

The lead oxysulfide cell has been

advocated because of its large signal-output and extreme quietness — it produces no "photocell hiss" when illuminated by unmodulated light. Use of this cell requires a scanning-beam optical system corrected for the deep infrared.

Cause of Photocell "Hiss"

Photocell hiss, a phenomenon common to all photoemissive cells, posed a serious problem to sound technicians in the early days of sound-on-film recording. The first soundtracks, both variable-area and variable-density, allowed approximately half of the full intensity of the scanning beam to fall on the photocell during moments of silence. In the case of variable-area recording, the unmodulated track was half black and half clear; while with variable-density recording, the track, when unmodulated, was a light gray of roughly 50% lighter transmission. This intensity of photocell illumination was enough to mar the intended silences with a hissing noise, and it also had the disadvantage of allowing the scanning beam to be strongly modulated by scratches and specks of dust on the film.

To overcome these annoyances, methods of "noiseless" recording were introduced. All of them depend on darkening the soundtrack during moments of silence. In variable-area tracks the width of the clear areas diminish with diminishing volume; in variable-density tracks the entire track darkens with decreasing volume. The apparatus for "biasing" the tracks is very simple.

Even though the use of noiseless recording is universal at the present time, the projectionist working with equipment in which sound changeovers are made by switching the exciting-lamp current from one machine to the other must guard against leaving sound volume on at normal levels before and after shows and during intermissions when no film is threaded up to prevent the full scanning beam from reaching the photocells. The hiss is annoying, and when 50- or 60-cycle A.C. is used for supplying the exciters, moderately loud hum will also be heard in the auditorium.

Checking Photocell Circuit

The current flowing in the photocell circuit of a sound-film reproducer is only about one millionth of an ampere at most. So tiny is this current

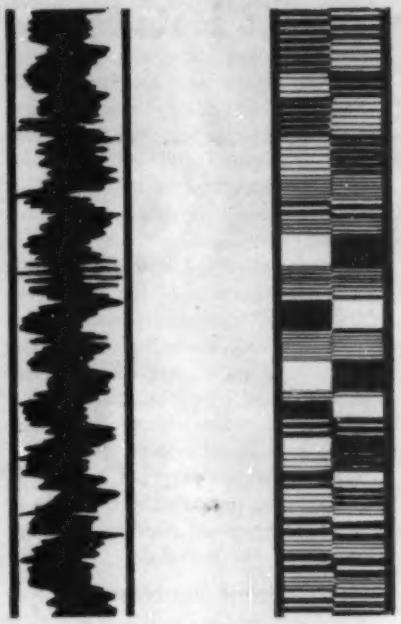


FIG. 6. Push-pull tracks.

that corroded or loose connections anywhere in the circuit will generate clicking or raspy noises, or even total loss of sound. It is always a good idea to check all soundhead connections at least once a year and to make sure that the prongs of the photocell are clean and make firm contact in the socket.

Varying magnetic and electrostatic fields induce currents in conductors. Induced currents in the photocell circuit do not have to be very great to cause hums and other noises in the sound. This is why all photocell leads are carefully shielded and, if very long, run in coaxial cable to prevent attenuation of high frequencies by capacitance-effects. In some equipments the photocell output is "stepped down" by a transformer to minimize the pickup of noise in the wires that connect the photocells to the amplifier. Other equipments use preamplifiers either in the soundheads or very close to them to make the circuits as short as possible.

Contrary to opinion in some quarters, even modern photocells of good quality will eventually wear out. Continual bombardment of the photo-electric cathode by gas-ions results in a gradual decrease of sensitivity. Some cells give satisfactory service for years; others, for reasons unknown, "die" in a few months. The life of any gas-filled cell is shortened by excessive anode voltage, of course; and if voltage is so high that the cell glows, the photosensitive surface is destroyed almost at once.

Discard Imperfect Cells

Photocells having loose glass envelopes should be discarded because the entire cell, including the cathode, may vibrate when the projector is running, introducing machine noises into the sound.

Loose connections in the exciting-lamp circuit usually do not produce noises—the filament heats and cools too slowly—but they often cause temporary loss of volume or even sound outages. Careful visual inspection of the exciter while it is burning will reveal any flickering, and tapping the bulb and tugging at the wires ordinarily turns up the source of the trouble.

Sound troubles caused by flickering exciters occur fairly often because the heavy current consumed by the bulb (from 5 to 10 or 12 amperes) heats and burns corroded contacts and other weak points that offer resistance to the flow of current.

Exciting lamps do not last as long as photocells. Like any lamp bulb, they are always in danger of burning out. Slight over-volting seriously shortens the life of the bulb. Exciters with sagging filaments and heavily blackened glass envelopes should always be replaced to avoid burnouts during a show.

Dirt in the "sound aperture" of old-style soundheads cuts down volume by cutting off part of the scanning beam. If a variable-area track is being played, "second-harmonic distortion" will result if the tops of the soundtrack variations are concealed by the dirt. Then, too, if a piece of dust in the sound aperture vibrates, a noise will be generated.

Dirt, Oil Effect Sound

All film has more or less dirt adhering to it. Even negatives which are treated with the utmost care pick up dust by electrostatic action. And when a print gets oily, the dirt and grime really stick fast. So to avoid loss of volume and "husky" sound, clean those old-fashioned "sound gates" after every reel or two.

Sound volume, especially in the higher frequencies, is lost whenever oil gets on the lenses of the optical tube. If a droplet of oil forms on the condensing lens of the usual

"stereopticon" type of optical tube, the resulting concentration of light on the slit may actually cause a marked increase in sound volume with more or less distortion. In such a case the oil droplet acts just like a small lens of very short focal length. When the heat of the exciting lamp vaporizes the oil droplet, the volume will fall off to normal.

No oil should ever get into or even on the optical unit. Naturally, if the projection mechanism leaks oil, some of it is bound to find its way into the sound-head where it isn't needed or wanted. When the oil exists in the form of vapor, volatilized by the hot exciter, it may eventually seep *inside* the optical unit where it will cause all kinds of trouble.

Modern optical tubes are supposed to be hermetically sealed, but manufacturers have found that it is almost impossible to keep the seals intact indefinitely.

Heat Strains Optical Unit

"The optical unit is exposed to a continuous heat-cycle due to the fact that it is located so close to the exciter lamp.* As the unit heats up, different parts, such as the glass lenses and their retaining rings, expand to different degrees. This strains the sealing cement which eventually allows minute air leaks to form. From then on, whenever the optical unit heats up, the air inside expands and escapes through these air leaks.

"When the exciter lamp is turned off, the air inside the unit contracts, creating a partial vacuum which draws air in from outside. If this air is laden with oil vapor, the oil is drawn into the unit and finally condenses inside.

"This continual 'breathing' of the optical unit eventually causes enough oil to collect inside to seriously impair the quality of sound reproduction. This trouble can be largely overcome if the sound-head and projector are kept clean and free of excess oil at all times. The air in the vicinity of the optical system will then contain no oil vapor, and hence the 'breathing' action will not be harmful, if it take place."

Leaky automatically-lubricated projectors and old, worn-out mechanisms which have to be over-oiled to run properly are the chief culprits. In both cases the mischief can be eliminated by repairing the projectors and replacing worn and defective parts.

In the dear, dead days of silent movies, many projectionists periodically gave their mechanisms "kerosene baths" to wash away old, grimy oil from the gears and bearings. This may have been dandy treatment for the Powers projector, which has exposed gear-work; but coal-oil ablutions have no place in these days of sound pictures. Kerosene carries oil into the soundhead.

Deposits of emulsion, dirt, and film-wax on the runners of the soundgate (in the older equipment) and on the polished rotary scanning drum (in modern equipment) may displace the film out of the true focal plane of the optical unit. This focus is rather critical, and cleanliness of the soundhead helps it to "stay put." Dirt is removed from the polished metal parts with an orangewood stick or a copper coin. These won't scratch.

Demagnetizing Not Needed

What about demagnetizing the projector mechanism and soundhead? It's necessary only if you have a magnetic reproducer for CinemaScope tracks. Magnetic tracks are likely to pick up weird noises and suffer loss of sound if magnetic fields exist in the projector parts. Photographic tracks and optical reproducers totally ignore magnetism in the sprockets, film runners, tension pads, idlers, *etc.*, so why waste time demagnetizing things that don't need to be demagnetized?

Exciter focus and cleanliness of the optical-tube lenses are other important points to keep in mind. (We mentioned previously the focus of the optical tube itself.) In practice, the position of the exciter is adjusted until the spot of light on the photocell cathode (the yellowish-brown photosensitive plate) has maximum brightness. This adjustment should always be made when a new exciting lamp is installed. As the exciter ages, however, the filament may sag sufficiently to destroy the adjustment; in such a case the position of the bulb should be altered to restore the full, bright spot of light on the photocell plate.

Equalizing Sound Output

If exciter focus is not up to par, sound output will be below normal. And if there's anything a projectionist dislikes, it's a difference in the sound output of the two projectors. Changeovers should not require the projectionist to boost the gain-setting of the volume control to compensate for a "low" machine.

The better sound equipments provide a means whereby the outputs of the two soundheads may easily be equalized. Before equalization is attempted, however, the optics of both soundheads should be adjusted for maximum output. After this has been done, identical frequency test loops are run in both machines simultaneously, and the output of the "louder" machine reduced until it exactly matches that of the other projector.

When a precise match has been attained, rapid changeovers on the fader will reveal no difference in the loudness of the test tones playing in both machines. Careful work will result in matching to within ½ db, the smallest volume-difference detectable by a trained ear under the most favorable conditions. The use of output meters makes possible even closer matching.

The means provided for balancing outputs differs in different makes and models of sound equipment. One method involves the use of a small potentiometer for the photocell "load resistance." Adjusting this potentiometer, which is usually located in the soundhead or preamplifier, varies the output without affecting the frequency-response of the system.

Another way is to insert a heavy rheostat in series with the exciting lamp. Adjusting the rheostat brightens or dims the exciter, thus changing the sound output without affecting quality. Now, a rheostat rugged enough to absorb the heavy exciter current costs much more than a light potentiometer (similar to the volume

* Quoted from the "RCA-Photophone Handbook for Projectionists." Second Edition, 1941, pp. 59-60.

Air Pilots Want Drive-in Info

Projectionists at drive-ins may not realize it, but their theatres are a source of considerable interest to the pilots of planes flying overhead because the drive-in makes a distinctive landmark. The Aircraft Owners and Pilots Assn. has requested drive-ins throughout the country to furnish their exact latitude and longitude, declaring that such information could "be the difference between life and death to some pilots and their passengers."

Information on latitude and longitude can be obtained at local or county engineers offices. The information can then be sent to the New York City offices of the Theatre Owners of America, 1501 Broadway, from where it will be forwarded to the aircraft group.

control of a small radio-set), but it furnishes excellent control. Some of the older sound equipments had such rheostats as well as voltmeters to show how much voltage was being supplied to the exciters.

Emergency Adjustment

In no case should an exciter be deliberately thrown out of focus to reduce sound output. Doing this may result in uneven slit illumination and hence distort the sound. A popular "emergency" method of reducing the output of a soundhead without affecting sound quality is to wrap one or more turns of clear, blank film around the photocell, holding it in place with rubber bands. Another method is to mask off a small portion of the cathode with rubber bands alone. These methods are strictly "haywire," but they are useful for equalizing outputs until the service engineer arrives to make the adjustment in the proper way.

Push-pull optical recording has been more or less of a plaything in the industry for many years. Fig. 6 shows what variable-area and variable-density push-pull tracks look like. Note that each track is split into two corresponding tracks having sound records 180 degrees out of phase. At any point of full modulation one "half-track" is dark while the other is light.

To reproduce these tracks a double-wedge prismatic lens is placed behind the scanning point to direct the modulated light from one half-track to one photocell and the light from the other half-track to a second photocell. Instead of two separate phototubes, a special double photocell, such as the RCA 920 with twin cathodes and anodes, may be used. The outputs of the two cells are combined in the preamplifier 180 degrees out of phase, exactly cancelling the 180-degree phasing of the two half-tracks. The combined output is then amplified in the usual way.

Push-Pull Advantages

The advantage of push-pull reproduction lies partly in its greater freedom from optical-distortion effects and in its perfect freedom from noise caused by lateral scratches and film splices. There is no need for "blooping" soundtrack splices when push-pull tracks are used, for no matter how carelessly the emulsion is scraped off, no thumps or clicks are heard.

Why do splices glide silently by in

You'll win, too . . .

GOING ONE STEP AT A TIME!

The tortoise took it step by step—
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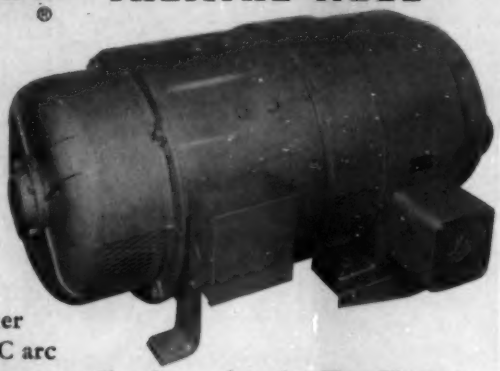

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Regardless of whether your demands for DC arc current for projection are small or large, there is a TransVerter particularly well-suited for your installation. The latest methods of manufacture, and new design features in Hertner TransVerters give users a source of DC power that is remarkable for its extreme steadiness, responsiveness, quietness and freedom from excessive maintenance. Write today, so that we may send you the interesting details of the TransVerter that will do the job for you—dependably and economically.

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push-pull reproduction? Splice-lines cross both half-tracks, of course. But the two photocells are 180 degrees out of phase. When the splice-line generates a strong "positive" signal in the output of one cell, it generates a strong "negative" signal in the output of the other. The two signals, being opposed, simply cancel.

An ordinary track played through a push-pull soundhead produces no sound. It is necessary, in such a case, to reverse the electrical phasing by a switching arrangement to play ordinary tracks. Conversely, a push-pull track gives no sound if played in an ordinary soundhead — the two half-tracks exactly cancel one another optically.

Almost any modern soundhead can be fitted for push-pull reproduction. In fact, many manufacturers supply conversion kits and special output-transformers or preamplifiers for this purpose. Push-pull recording was often used in studios before the introduction of magnetic recording to maintain the highest sound quality. The completed push-pull tracks were re-recorded as normal tracks for release printing.

Ordinary optical, or photographic sound reproduction is definitely not a dead duck. It has many points in its favor. And push-pull photographic reproduction is even better than the ordinary kind.

IA OBITUARIES

EVERETT BATY, Sr., 62, member of Local 447, Springfield, Mo., succumbed to a fatal heart attack last month. He complained of feeling ill while visiting Ralph Foster, manager of Station KWTO, in his cabin near Kissee Mills, but died before he could be taken to a hospital. Baty was president of Local 447 for more than 20 years and was one of its charter members. He was a member of Gate of the Temple Masonic Lodge in Springfield, and of the Abou Ben Adhem Temple of the Shrine. Besides his wife, survivors include a son, two daughters, and a stepson.

LEO A. CORTESY, 71, charter member of Local 93, Spokane, Wash., died following surgery. A native of Belgium, Cortesy worked in motion picture theatres in and around Spokane for the last 45 years. Several years ago the Local honored him as one of the two remaining charter members.

BUY U. S. SAVINGS BONDS

HORIZONTAL PROJECTOR

(Continued from page 17)

the use of standard 35-mm film stock turned on its side makes possible the equivalent of a 70-mm image on narrower film, thereby increasing the film size without increasing the tendency to buckle the film and throw the picture out of focus. The tension pads on the horizontal projector are no farther apart than on a standard model, it was said in explanation.

However, it was noted by others that film buckle is caused basically by an expansion of the emulsion of the picture area from the heat of the arc, and that the picture area presented by the horizontal projector is approximately as great as the area presented by wider 65- or 70-mm film used in the Todd AO system and in a projector under development at 20th Century-Fox.

Just how important a part the larger film will play in the future of the motion picture business is still most indefinite. It was rejected before in the late twenties and early thirties as being too expensive and impractical. Barney Balaban says that its use is warranted only where "Tiffany" projection is desired and a screen over 50 feet wide is used. He placed the number of such theatres in the United States at about 100. Other estimates place them as low as 50. These figures presumably do not include drive-ins.

It is difficult to say just what will happen next in these days of violent competition with the Tv interests, but the big film could be the tool required to present a really spectacular show—something that a Tv set couldn't possibly compete with. In any case it stands a good chance of finding important use in large first-class houses and drive-ins.

Technicolor Hires 150

As a result of a 25% increase in orders for color release prints, Technicolor has added about 150 people to its staff since July 1. Improving conditions at the boxoffice and an industry-wide demand for more prints were responsible for the increased business, Dr. Herbert T. Kalmus, president of Technicolor, announced in Hollywood.

Chicago C'Scope Installations

About 33% of Chicago-area theatres have been equipped for CinemaScope, according to a recent estimate by 20th Century-Fox. The figure includes 197 theatres out of a total of 594.

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Scene from "THE EGYPTIAN," 20th Century-Fox CinemaScope Epic

sharpest image, edge-to-edge...

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Camden, N. J.

Giant Drive-in Opens In Detroit Suburb

A giant 1500-car drive-in, designed for all the latest picture and sound reproduction techniques, was recently opened on the outskirts of Detroit near U. S. Route 24. Known as the Jolly Roger, this outdoor theatre has a screen tower measuring 122 by 82 feet. The tower is curved and leans slightly forward so as to direct the largest possible amount of light at the audience in the parked vehicles.

Owned by Nicholas George Theatres, an independent circuit operating in metropolitan Detroit, the Jolly Roger has a projection throw of 540 feet, one of the longest on record.

Installation of projection, sound and field equipment was supervised by Al Boudouris, Theatre Equipment Co., Toledo. This equipment included Century water-cooled projectors, Strong "Super 135" arclamps, Strong rectifiers, Kollmorgen objective lenses and Bausch & Lomb anamorphics for CinemaScope. 1800 watts of undistorted sound is available to the Eprad 3-speaker, in-car sound units.

The screen tower consists of 8 steel frames with 16 bases supported on anchor bolts embedded in 40 cubic yards of concrete, credited with being able to withstand a wind stress of 180 miles per hour. Completely finished in Johns Manville Transite, the tower presents a picture area of 7,500 square feet.

SMPTE Convention in Los Angeles

CONTINUING improvements in the field of magnetic reproduction and recording, and the problem of obtaining more light for large indoor and outdoor theatre screens were important topics at the 76th Annual Convention of the Society of Motion Picture and Television Engineers, held Ocober 18 to 22 at the Ambassador Hotel in Los Angeles.

Some of the technical papers read at the convention that are of particular interest to projectionists are described briefly below. Where a description of the paper was not available at press time, only the title and authors are given.

IMPROVEMENTS IN CONDENSING SYSTEMS FOR 35-mm PROJECTION

R. M. ALTMAN, A. E. NEUMER and H. H. SCHROEDER

Bausch & Lomb Optical Co.

In order to take full advantage of the new *f*/1.8 high-speed projection lenses, faster condensing systems than those now available are required. The design considerations of such systems are discussed and experimental data is given. The increase in screen illumination afforded by these new condensers is accompanied by greater energy at the film gate, necessitating more efficient heat control techniques. Optical devices for achieving this are described.

NEW STUDIO ZOOMAR FOR 35-mm MOTION PICTURES

FRANK G. BACK

Zoomar, Inc., Glen Cove, L. I.

A new Zoomar lens, especially designed for 35-mm motion picture work, will be demonstrated. It has a focal range from 40-mm to 120-mm and a speed of *f*/4. Compared to the old Zoomar-35 it is light (6 lb.) and only 7½ in. long including a coupled, wide-vision viewfinder. This viewfinder is

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without eyepiece or peephole and therefore does not restrict the head movements of the cameraman. Performance of the new lens is so much better than that of the old Zoomar-35 that, even when wide open, its image quality comes very close to that of a good standard 35-mm motion picture lens.

CINEMASCOPE CAMERA LENSES

JOHN D. HAYES

Bausch & Lomb Optical Co.

The wide acceptance by the motion picture industry of the CinemaScope process of motion picture presentation created a pressing need for camera taking lenses of a variety of focal lengths. Described are the optical and mechanical aspects of the development of a series of lenses designed specifically to provide this needed choice.

AN ELECTRONIC COMPARATOR FOR AUTOMATIC INSPECTION OF MAGNETIC SOUND PRINTS

JEROME W. STAFFORD

Sound Dept., M-G-M Studios

This paper describes an electronic system for comparing magnetic sound prints with the master track during the printing operation. In the release printing of CinemaScope pictures the comparator is a useful tool for the automatic inspection of the product.

MAGNETIC HEAD WEAR INVESTIGATION

M. RETTINGER

Radio Corporation of America

For a given film and film wrap angle, magnetic head life is proportional to the film pressure on the head produced by the film tension, the square root of the core radius, the 3/2 power of the pole face depth, the core width, and, in some undetermined manner, the core hardness. More briefly, one may say that (for a constant film and film wrap angle) head life is proportional to the film pressure, volume of removable core material, and core hardness.

CINEMASCOPE IN DRIVE-IN THEATRES

RALPH H. HEACOCK

Radio Corp. of America

CinemaScope (or any of the other wide-screen, multiple-channel sound, new techniques) presents three important problems to the drive-in theater. The first is a very wide screen. The second is a suitable light source which can provide enough light to illuminate the wide screen acceptably. The third is the possible use of multiple-channel sound. These problems and their prac-

Since the advent of Wide Screen and CinemaScope *thousands* of progressive theatre operators have equipped their projectors with Hilux and Super-Lite projection lenses—*for use as prime lenses* with their anamorphic attachments.

Your patrons, too, will appreciate the superior quality that over 30 years of lens craftsmanship have engineered into the Hilux *f*/1.8. **$270 up** per pair at your Theatre Supply Dealer.

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tical application to currently operating drive-in theaters are briefly discussed.

SHRINKAGE BEHAVIOR OF MOTION PICTURE FILM

C. R. FORDYCE, J. M. CALHOUN
and E. E. MOYER
Eastman Kodak Co.

Shrinkage characteristics of both 35-mm and 16-mm films manufactured by the Eastman Kodak Co. have been evaluated by laboratory measurements and by examination of film in commercial use. Results of these investigations were presented.

MEASURING MAGNETIC STRENGTH OF 16-mm MAGNETIC SOUNDTRACKS

ROBERT SCHWARTZ, SHELDON I. WILPON
and ROBERT A. COMERCI
Bureau of Ships, U. S. Navy

The Material Laboratory at the Navy Yard is in the process of developing a method for measuring the magnetic strength existing on 16-mm magnetic soundtrack by utilizing a nonmagnetic loop for the determination of the absolute surface induction at 400 cycles/sec for "pegging" the relative surface induction vs. frequency characteristic obtained by the "short gap" or other approved method.

This paper shows that this method was found to be a practical method for determining the surface induction recorded on presently available commercial 1¼-in. magnetic tapes, independent of the tape characteristics and the depth of penetration of the recorded signal.

Abstracts of the following not available.

NEW METHODS OF SPLICING FILM

D. C. CHAMBERS AND W. R. HOLM
E. I. Du Pont de Nemours & Co.

IMPROVED HIGH-BRIGHTNESS SCREEN FOR DRIVE-IN THEATRES

PETRO VLAHOS
Motion Picture Research Council

CHROMATICITY CHARACTERISTICS OF THEATRE SCREENS

PAUL ZEFF and JOHN P. LIVADARY
Columbia Pictures Corp.

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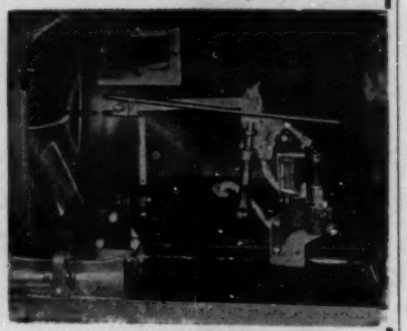

Uses positive carbon stubs of any length, without preparation. When entirely consumed, the new carbon goes into use without losing the light, or otherwise affecting lamp operation. Burns average lengths (3¼") down to ¾", saving 2½" or 22.2% of carbon costs. Average saving $400.00 annually.

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TOP-NOTCH PROJECTION

(Continued from page 10)

ing in particular features, components and operations, are designed to operate as follows:

1. Using 9-mm black positive carbons at 85 amperes and 58 arc volts.
2. Using 10-mm black positive carbons at 100 amperes and 60 arc volts.
3. Using 11-mm black positive carbons at 115 amperes and 55 arc volts.
4. Using 10-mm Hitex black positive carbons at 135 amperes and 66 arc volts.

Each successive current increase in the operation of these lamps gives more screen illumination. It is absolutely necessary, of course, that the generators or rectifiers in use deliver not only sufficient amperage but also have proper voltage rating. It is understood, of course, that the most satis-

ETHYLOID FILM CEMENT
UNION MADE FISHER MANUFACTURING CO. 1185 MT. READ BLVD., ROCHESTER 6, N. Y. UNION MADE

factory results from the use of a 10-mm Hitex carbon arc pulling 135 amperes is dependent upon the correct source of power supply, either rectifiers or generators having the proper voltage characteristics.

If the theatre already has lamps designed to operate with 9-mm black positive carbons, they may be modified to burn 10- or 11-mm carbons. This , of course, entails the change of a portion of the lamp mechanisms, and usually the addition of blowers for the lamphouse or some satisfactory cooling adjunct, depending upon the type of lamp used.

The Peerless HyCandescent condenser-type arclamp, which operates at 160 amperes and 77 arc voltage using 13.6-mm H. I. carbons, and at 180 amperes and 74 arc voltage using 13.6-mm Hitex Super positive carbons is quite satisfactory in this respect.

It appears from National Carbon Co. figures that the total screen lumens delivered by reflector-type arclamps at 115 and 135 amperes are not widely different from the light delivered by condenser-type arclamps at peak operation.

The choice of which type of arclamp to buy must be guided by both the original and the operating cost of lamps and their attendant power sources. Our opinion is that the overall cost of reflector-type arclamps and attendant power source is far lower than the combination of condenser-type arclamps and generator.

If a filter be placed between the arclamp and the projector, there naturally will be a drop in screen illumination. Thus, an arclamp operating at 115 amperes without a

Finest Lenses Are Needed for New Projection Techniques...

THE ANSWER

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Today with the new movie techniques—CinemaScope, Vista-Vision, Wide Screen—exhibitors must have the finest basic lenses in order to give theatre goers sharp, clear pictures from edge to edge of the screen. There are no finer projection lenses made than Wollensak Cinema Raptars. (For CinemaScope these lenses are used with anamorphic lenses.) Cinema Raptars use six and seven element construction. Only with such a design is it possible to deliver full speed, edge-to-edge sharpness, and highest resolution. In addition, Cinema Raptars are the world's only perfectly matched lenses—focal lengths matched to within .0025! Marked as matched (twin) lenses. Speed ranges are f/1.9 in focal lengths from 2" through 5" and f/2.0 to f/2.7 in focal lengths to 7" . . . priced from $180 each.

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JUST PURCHASED NEW PROJECTION LENSES?

NEED ADJUSTMENTS FOR WIDE SCREEN?

WHAT TO DO WITH NON-ANAMORPHIC RELEASES?

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VARI-FOCUS

a supplementary lens for all screen sizes

With the new Vari-Focus lens exhibitors can show all the current screen releases without buying a complete new range of short focus lenses. The Vari-Focus permits you to make adjustments for screen width . . . change the focal length of your standard projection lens quickly and easily. (See table.) The Vari-Focus is a supplementary lens which will produce any wide screen aspect ratio (non-anamorphic) when used in conjunction with a 3" to 6" projection lens. The resolution and picture quality will match those of the finest projection lens. Price $235 each.

Standard Lens	Variable Focus From
3"	2¼" to 1⅞"
3½"	2⅝" to 2"
4"	3⅛" to 2¼"
4½"	3½" to 2½"
5"	4" to 3"
5½"	4½" to 3½"
6"	5" to 3½"

WRITE for new literature fully describing this supplementary lens. Wollensak Optical Co., Rochester 21, N. Y.

MASTERPIECES of Optical Craftsmanship by WOLLENSAK

filter will produce as much *net* screen illumination as is obtainable at 135-ampere operation while using a filter. This fact should be considered in determining the type of equipment and the carbon trim to be used.

If the projectors in use are equipped with adequate aperture-cooling blowers, and the arclamps are equipped with blowers to help dissipate the heat, no filters are necessary at 85- 100- or 115-ampere operation. At 135-ampere operation, the use of a filter begins to be desirable; at high amperages they are definitely necessary.

Power Supply Sources

When a power source is being considered, a generator capable of delivering sufficient amperage at the proper voltage is widely regarded as being a better purchase than rectifiers, from the standpoint of initial and operating-cost. From a long-term wear standpoint, the generator is certain to outlast rectifiers by many, many years. If your theatre is served with single-phase current, you must obtain 3-phase current if you wish to operate high-amperage generators, as all except special-order and high-cost generators operate at 3-phase current.

Projectors

Projectors should be equipped with aperture-cooling blowers to help dissipate the heat from arclamps. The heat must be dissipated to insure a picture without an in-and-out focus condition. If the projectors are not now equipped with shutter blades cut down as far as possible, consistent with travel-ghost conditions, the blades should be changed.

By F. W. KEILHACK

Drive-In Theatre Mfg. Co.

While I do not feel that I have the complete answer to Mr. Elzey's question, I should like to describe a recent experience we had with a drive-in theatre near Kansas City. I believe the procedure used in this case will be of considerable help in solving Mr. Elzey's problem.

In the early part of the season, we were called to this drive-in where the arclamps were pulling 130 amperes. Their complaint was that they had a very poor light; also that they were breaking reflectors excessively. They did not have water-cooled jackets, but they did use filters in their lamphouses. We discovered a very poor ventilating system which was allowing the heat from the carbons to build up inside the lamp, thus permitting carbon dirt and gasses to fog the reflectors and generally mess up the lamp interior and the stacks.

We put in a pair of our single-stack "Atomic Jet" lamphouse blowers, and requested the projectionist to remove the heat filters from the lamp, reduce his amperage to 100, and install a pair of 180-cubic-feet-per-minute blowers at each mechanism, directing the air to the trap and aperture plate.

The result of this change, even

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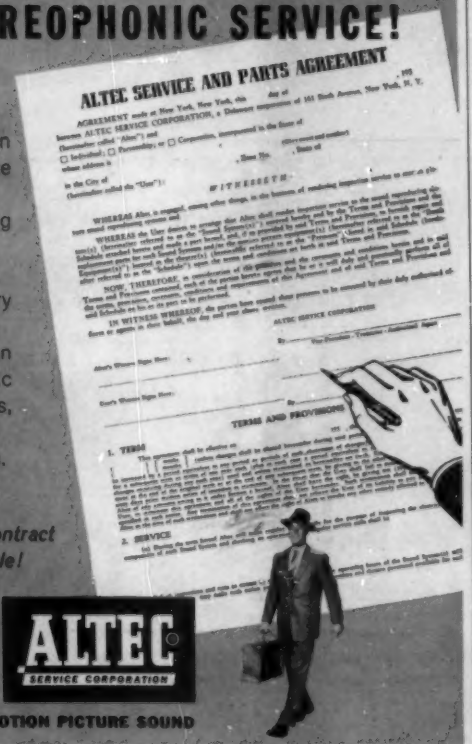

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though the amperage was reduced by 30, was a considerably brighter picture on the screen, the mechanisms are now running much cooler, the excessive heat is being exhausted from the lamp, and they are no longer experiencing reflector trouble.

So, as you can see, the overall net saving to this situation by the installation of these lamphouse blowers—no more reflector breakage, less carbon consumption, cooler mechanisms, and a brighter picture at the tower—offset the cost of the installation many times.

There is another important feature of our lamphouse blower: since it is on the outside of the pipe at the first joint above the lamphouse, it picks up radiated heat from the lamp and exhausts it rather than leaving this heat in the projection room.

By E. B. HEYER

Heyer-Shultz, Inc.

PAT ELZEY has done about everything possible to obtain maximum screen light with his present equipment. As we see it, he will have a screen brightness of approximately 4 or 5 foot-lamberts on his 78-foot wide screen, provided he is using our *aluminized* metal reflector. Should he be operating with our *rhodium*-type reflector, his screen brightness would be 15% less than this.

If Mr. Elzey wishes to obtain a screen brightness of better than 4 or 5 foot-lamberts, he will have to install new lamps that are properly designed for the larger carbon trims and higher amperage. We would venture to say that for what he is attempting to achieve in screen brightness it will be necessary that he burn up to 130 amps, but such information should be obtained from the manufacturer of whatever lamp he might decide to use.

By LEONARD SATZ

Raytone Screen Corp.

WHILE I am not familiar with the Gardiner projector, I do not care especially for the barrel-type shutter. However, this cannot matter too much in this instance. The lenses

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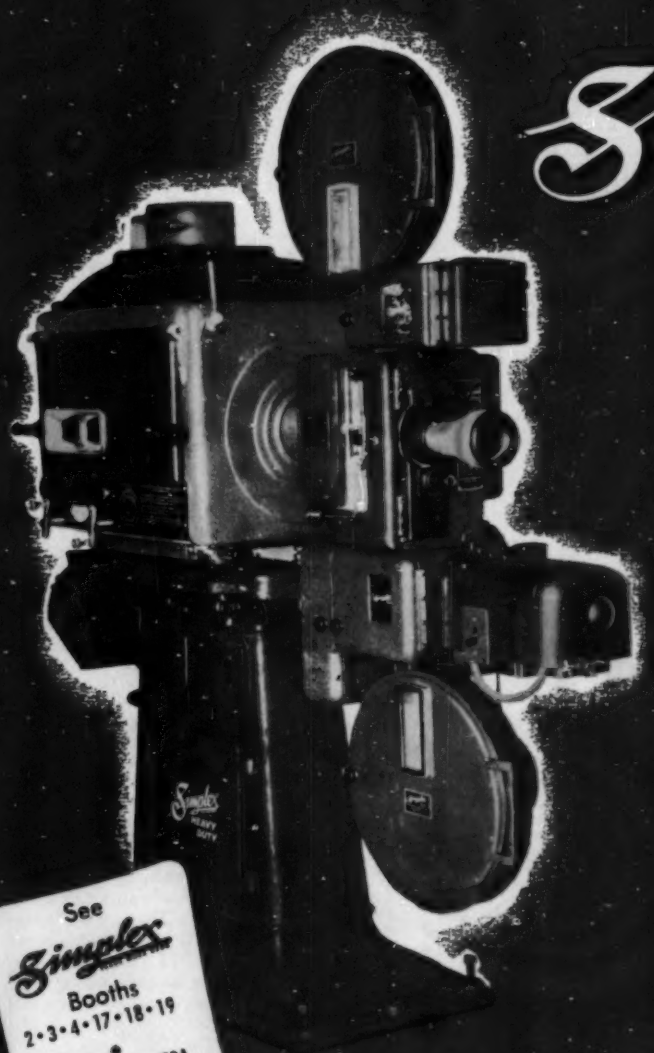

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